ICP/EXT-04-00429
Revision 5

Health and Safety Plan for the V-Tanks Area CERCLA Site Remediation at Test Area North, Waste Area Group 1, Operable Unit 1-10

November 2005

Idaho Cleanup Project

The Idaho Cleanup Project is operated for the
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Revision 5
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Idaho Cleanup Project

Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14516

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REVISION RECORD

Revision Number	Date	Description	Comments
0	September 2004	Original issue.	
1	December 2004	Revised to incorporate scope for the remediation of WAG-1 New Sites along with the V-Tanks.	This because of the co-location and simultaneous work activities.
2	April 2005	Revised to incorporate greater detail for waste transfer and treatment process following completion of system installation, changes to empty V-Tank lift approach, and waste disposition of the V-4 caustic tank	
3	June 2005	Revised to comply with new project requirements and organizational changes.	
4	August 2005	Revised to incorporate information for the solidification of treated V-Tanks contents waste.	
5	November 2005	Revised to incorporate changes to the off-gas system to eliminate the use of GAC filtration of the VOCs during the Phase I Treatment process	Update document to reflect operational changes incorporated as a result of the GAC fire.
		Clarify project roles and responsibilities and incorporate project organization chart.	
		Identify specific personnel and area monitoring to be conducted by the project assigned IH in Section 3.	Document to reflect operational changes where GAC beds have been removed so no capture of VOC will be present.

ABSTRACT

This health and safety plan establishes the procedures and requirements used to eliminate or minimize health and safety risks to personnel performing remediation activities and field sampling in and around TSF-46, TSF-47, and TSF-48, the V-Tanks (TSF-09 and TSF-18), and the TSF-19 TAN-616 caustic tank. The remediation around the V-Tanks includes tank and tank contents removal, waste transfers, Phase 1 treatment (air sparging) of consolidated tank contents and associated activities, consolidation tank sampling and sample returns, solidification of the treated waste, soil removal and disposal, site backfill and restoration as required by the Remedial Design/Remedial Action Work Plan Addendum 2 for the TSF-09/18 V-Tanks, and remediation activities associated with TAN new sites. Activities associated with the TSF-19 caustic tank include disposal actions. This health and safety plan contains information about the hazards involved in performing the work as well as the specific actions and equipment that will be used to protect personnel while working at the task site.

This health and safety plan is intended to give health and safety professionals the flexibility to establish and modify site health and safety procedures throughout the entire span of site operations based on the existing and anticipated hazards.

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TABLES

ACRONYMS

ACGIH	American Conference of Government Industrial Hygienists
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
AOC	area of contamination
ARA	Auxiliary Reactor Area
ARDC	Administrative Record and Document Control
CA	contamination area
CAM	continuous air monitor
CERCLA	Comprehensive Environmental, Response, Compensation and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CNS	central nervous system
CPR	cardiopulmonary resuscitation
CRC	contamination reduction corridor
CRZ	contamination reduction zone
D&D	decontamination and decommissioning
DAR	document action request
dBA	decibel A-weighted
DCE	cis-and trans-dichloroethene
DEQ	Idaho Department of Environmental Quality
DOE	U.S. Department of Energy
DOE Idaho	U.S. Department of Energy Idaho Operations Office
DRD	direct reading dose
EAC	estimate at completion
EDF	engineering design file
EPA	U.S. Environmental Protection Agency
ERO	Emergency Response Organization

EZ	exclusion zone
FFA/CO	Federal Facility Agreement and Consent Order
FM	Factory Mutual
FOM	field operations manager
FR	Federal Register
FRG	Final Remediation Goal
FSP	field sampling plan
FTL	field team leader
GDE	guide
GFCI	ground-fault circuit interrupter
GI	gastrointestinal
HASP	Health and Safety Plan
HASS	Hazard Assessment and Sampling System
HAZWOPER	hazardous waste operations and emergency response
HCA	high-contamination area
HDPE	high-density polyethylene
HEPA	high-efficiency particulate air
HPGe	high-purity germanium detector
HRA	high-radiation area
HSO	health and safety officer
HWMA	Hazardous Waste Management Act
IARC	International Agency for Research on Cancer
ICDF	Idaho CERCLA Disposal Facility
ICMS	INL Chemical Management System
ICP	Idaho Completion Project
IDLH	immediately dangerous to life or health
IEDMS	Integrated Environmental Data Management system
IET	Initial Engine Test
IH	industrial hygienist

INL	Idaho National Laboratory
INEEL	Idaho National Engineering and Environmental Laboratory
IP	ionization potential
ISMS	Integrated Safety Management System
JSA	job safety analysis
LOFT	Loss-of-Fluid Test
LTS	long-term stewardship
MCP	management control procedure
NEPA	National Environmental Policy Act
NFM	nuclear facility manager
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
NTP	National Toxicology Program
OMP	Occupational Medical Program
OSHA	Occupational Safety and Health Administration
OU	operable unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCM	personnel contamination monitor
PEL	permissible exposure limit
PEP	project execution plan
PLN	plan
POD	plan of the day
PPE	personal protective equipment
ppm	parts per million
PRD	program requirements document
QAPjP	Quality Assurance Project Plan
QC	quality control
RA	radiation area

RadCon	Radiological Control
RAO	remedial action objective
RBA	radiological buffer area
RCIMS	Radiological Control and Information Management System
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RD/RA	remedial design/remedial action
RI/FS	remedial investigation/feasibility study
RPE	registered professional engineer
RWP	radiological work permit
S&H	safety and health
SAD	site area director
SAM	sample analysis manager
SAP	sampling and analysis plan
SCBA	self-contained breathing apparatus
SH&QA	safety, health, and quality assurance
SMC	Specific Manufacturing Capability
SMO	Sample Management Office
SOW	statement of work
SRM	Subcontractor Requirements Manual
SSA	soil storage area
STD	standard
STEL	short-term exposure limit
STL	sampling team leader
SVOC	semivolatile organic compound
SWP	safe work permit
SZ	support zone
TAN	Test Area North
TCE	tricholoroethene

TCLP	toxicity characteristic leaching procedure
TCP	TAN Completion Project
TLV	threshold limit value
TPR	technical procedure
TSF	Technical Support Facility
TWA	time-weighted average
UL	Underwriters Laboratories, Inc.
UV	ultraviolet light
VCO	Voluntary Consent Order
VHRA	very-high-radiation area
VOC	volatile organic compound
VPP	Voluntary Protection Program
WAG	waste area group
WCC	Warning Communications Center
WGS	Waste Generator Services
WRRTF	Water Reactor Research Test Facility

Health and Safety Plan for the V-Tank Area CERCLA Remediation at Test Area North, Waste Area Group 1, Operable Unit 1-10

1. INTRODUCTION

1.1 Purpose

This Health and Safety Plan (HASP) establishes the procedures and requirements used to eliminate or minimize health and safety hazards to personnel conducting sampling and remediation activities of soil—as described in the *Field Sampling Plan for the V-Tank Area New Sites, for Test Area North, Waste Area Group 1, Operable Unit 1-10* (DOE/NE-ID 2004a), *Field Sampling Plan for TSF-09/18 V-Tanks Phase I Treatment* (ICP 2004a), *Field Sampling Plan for the TSF-09/18 V-Tanks and Contents Removal and Site Remediation for Test Area North, Waste Area Group 1, Operable Unit 1-10* (ICP 2004b) and the *Group 2 Remedial Design/Remedial Action Work Plan Addendum for the Assessment and Cleanup of V-Tank Area New Sites, for the Test Area North, Waste Area Group 1, Operable Unit 1-10* (DOE/NE-ID 2004b). In addition, this HASP addresses remediation of the Group 2 V-Tanks (TSF-09 and TSF-18) and tank contents removal, Phase 1 treatment (air sparging) of consolidated tank contents, tank content sampling, solidification of the treated waste, tank removal, soil removal and disposal, and site backfill and restoration at Test Area North (TAN), Waste Area Group (WAG) 1, Operable Unit (OU) 1-10 located at the Idaho National Laboratory (INL). The location of the INL Site within the State of Idaho is shown in Figure 1-1.

1.2 Scope and Objectives

This HASP has been prepared to support the Group 2 TSF-09 and TSF-18 activities outlined in the *Group 2 Remedial Design/Remedial Action Work Plan Addendum 2 for the TSF-09/18 V-Tanks and Contents Removal and Site Remediation Test Area North, Waste Area Group 1, Operable Unit 1-10* DOE/NE-ID 2005*)*. In addition, this HASP governs all work at TSF-46, TSF-47, TSF-48 and other new sites at WAG 1. This document has been written to meet the requirements of the Occupational Safety and Health Administration (OSHA) standard, "Hazardous Waste Operations and Emergency Response (HAZWOPER)" (29 CFR 1910.120). This HASP applies to all personnel who enter the project area. A separate HASP or revision to this document may be prepared that addresses Phase 2 (chemical oxidation) treatment of the tank contents.

This HASP has been reviewed and revised as deemed appropriate by the health and safety officer (HSO) in conjunction with other project personnel and management to ensure its effectiveness and suitability.

1.3 Idaho National Laboratory Site Description

The INL, formerly the National Reactor Testing Station, encompasses 2,305 km^2 (890 mi^2), and is located approximately 55 km (34 mi) west of Idaho Falls, Idaho. The U.S. Department of Energy Idaho Operations Office (DOE Idaho) has responsibility for the INL and designates authority to operate the INL to government management and operating contractors.

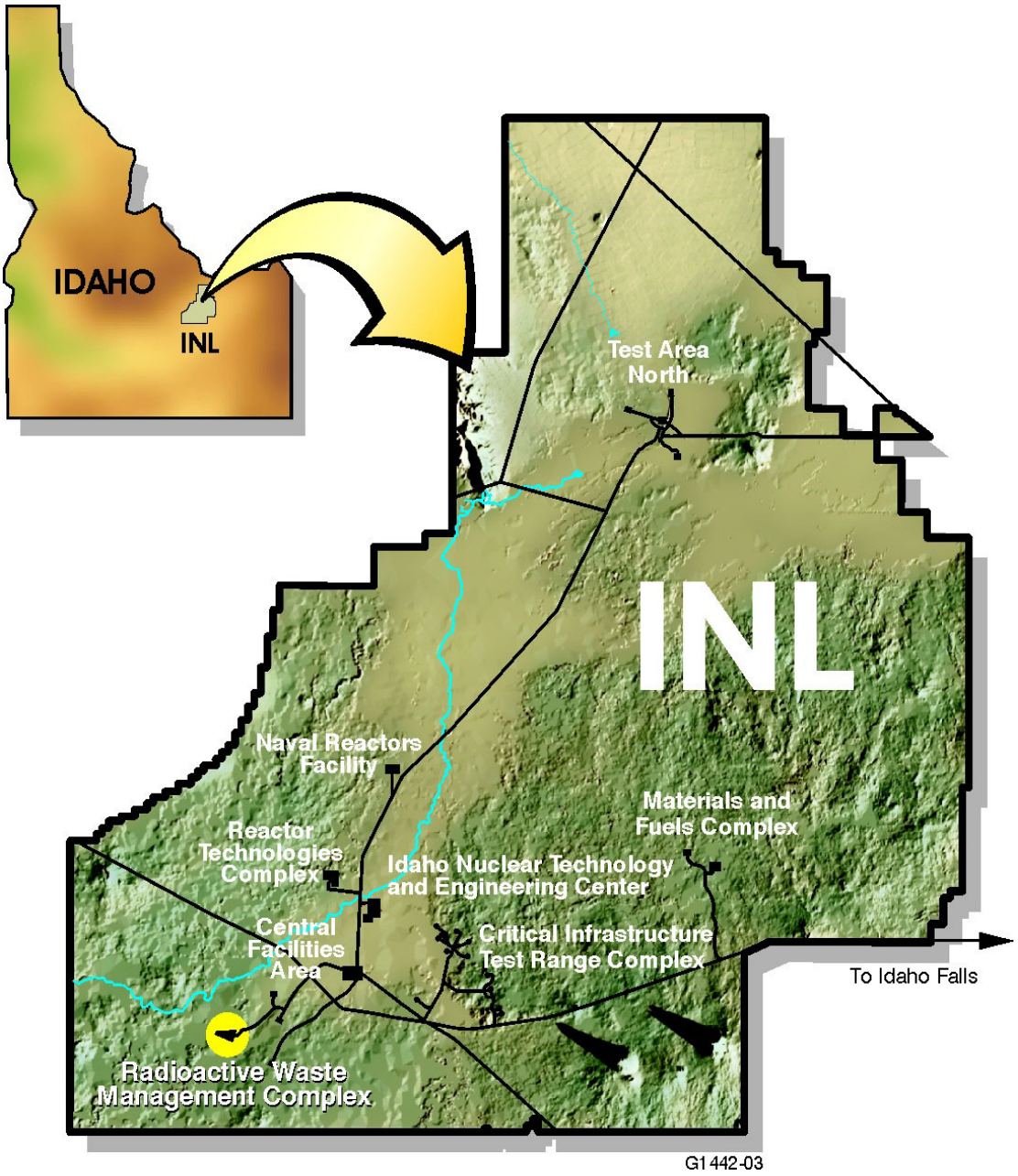


Figure 1-1. Map showing the location of the INL Site and TAN.

The United States Atomic Energy Commission, now the U.S. Department of Energy (DOE), established the National Reactor Testing Station (now the INL) in 1949 as a site for building and testing a variety of nuclear facilities. The INL has also been the storage facility for transuranic radionuclides and radioactive low-level waste since 1952. At present, the INL supports the engineering and operations efforts of DOE and other federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management technology development, energy technology and conservation programs, and DOE long-term stewardship programs.

In November 1989, because of confirmed contaminant releases to the environment, the Environmental Protection Agency (EPA) placed the INL on the "National Priorities List for Uncontrolled Hazardous Waste Sites" (54 FR 223). In response to this listing, the DOE, EPA, and the Idaho Department of Environmental Quality (DEQ), herein referred to as the Agencies, negotiated the Federal Facility Agreement and Consent Order (FFA/CO) and Action Plan (DOE-ID 1991). The Agencies signed these documents in 1991, establishing the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INL in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and the Idaho Hazardous Waste Management Act.

1.4 Test Area North Description

To better manage cleanup activities, the INL was divided into 10 waste area groups (WAGs). TAN, designated as WAG 1, includes fenced areas and immediate areas outside the fence lines at the Technical Support Facility (TSF), the Initial Engine Test (IET) Facility, the Loss-of-Fluid Test (LOFT) Facility, the Specific Manufacturing Capability (SMC) Facility, and the Water Reactor Research Test Facility (WRRTF) (DOE-ID 1999).

Figure 1-2 shows the location of the various facilities at TAN, which is located in the north-central portion of the INL Site. The facility was constructed between 1954 and 1961 to support the Aircraft Nuclear Propulsion Program, which developed and tested designs for nuclear-powered aircraft engines. When Congress terminated this research in 1961, the area's facilities were converted to support a variety of other DOE research projects. From 1962 through the 1970s, the area was principally devoted to the LOFT Facility, where reactor safety testing and behavior studies were conducted. Beginning in 1980, the area was used to conduct research and development with material from the 1979 Three Mile Island reactor accident (DOE-ID 1998). During the mid-1980s, the TAN Hot Shop supported the final tests for the LOFT Program. Current activities include the manufacture of armor for military vehicles at the SMC Facility, and nuclear storage operations at TSF. Decontamination and decommissioning (D&D) has recently been completed at the IET Facility.

1.5 Site Description

As a supporting document to the Group 2 RD/RA Work Plan (RD/RAWP) Addendum 2, Revision 2 (DOE/NE-ID 2004c) and the Group 2 RD/RA Work Plan Addendum for New Sites (DOE/NE-ID 2004b), this HASP provides only a brief background of the V-Tank area. Detailed background information for TSF-09 and TSF-18 is contained in the Group 2 RD/RAWP (DOE-ID 2002) and the second addendum to that document (DOE/NE-ID 2004c). Detailed background information for TSF-46, TSF-47, and TSF-48 areas is presented in the *Group 2 RD/RA Work Plan Addendum for the Assessment and Cleanup of V-Tank Area New Sites, for the Test Area North, Waste Area Group 1, Operable Unit 1-10* (DOE/NE-ID 2004b).

1.5.1 TSF-09, Tanks V-1, V-2, and V-3

The TSF Intermediate-Level (Radioactive) Waste Disposal System (TSF-09) is situated in an open area east of TAN-616 and north of TAN-607 as shown in Figures 1-3 and 1-4. TAN-616 has been removed prior to implementation of this HASP. TSF-09 consists of three underground storage tanks (USTs) (V-1, V-2, and V-3). These USTs are constructed of stainless steel, 3 m (10 ft) in diameter, 5.5 m (18 ft) long, buried approximately 3 m (10 ft) below grade, and have 50.8-cm (20-in.) manholes that are accessible through 1.8-m (6-ft) diameter culverts installed in 1981. These V-Tanks were installed in the early 1950s as part of the system designed to collect the following for treatment:

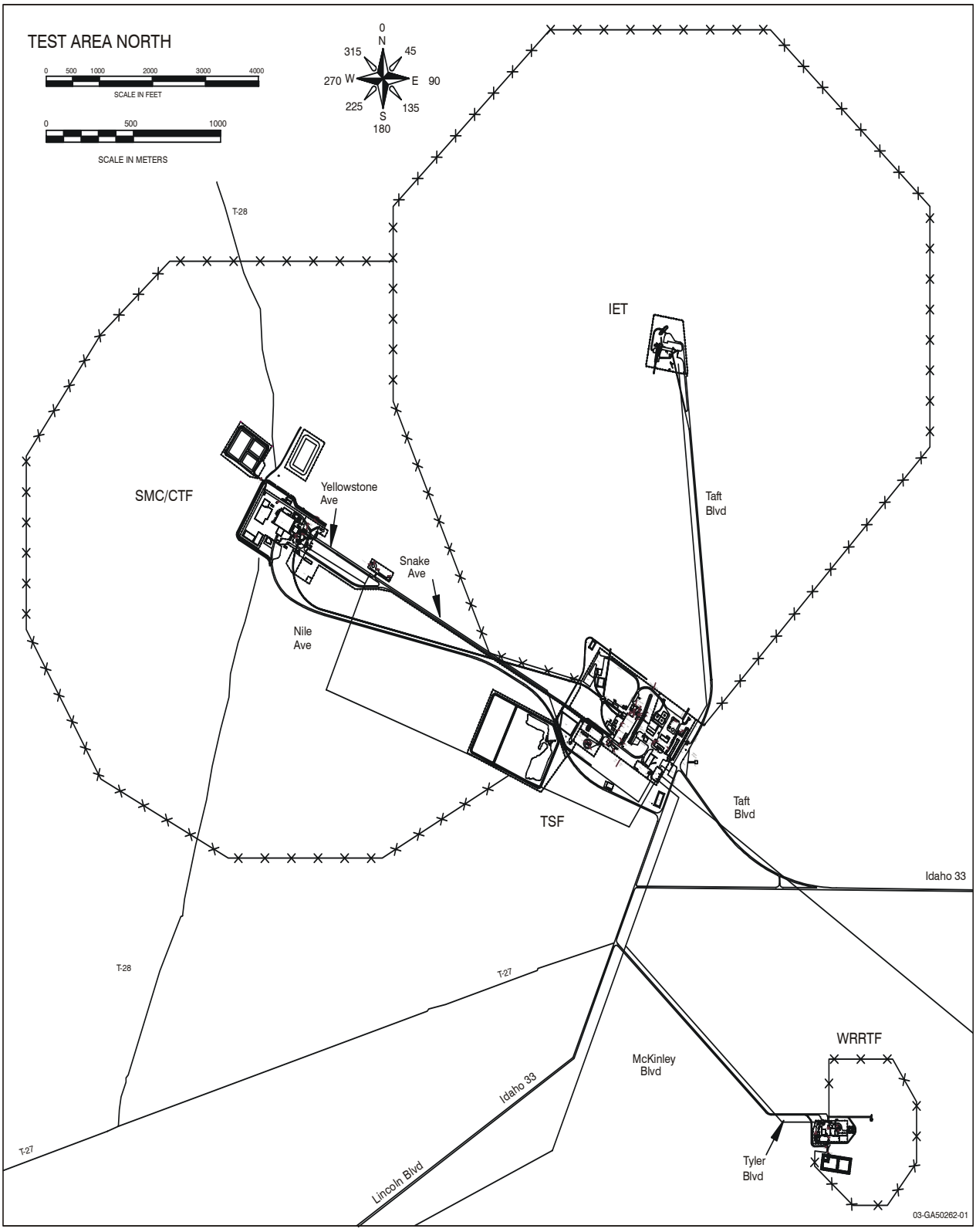


Figure 1-2. Map of the Test Area North Complex at the Idaho National Laboratory Site.

1. Radioactive liquid effluents generated in the hot cells, laboratories, and decontamination facilities at TAN

2. Waste from the Initial Engine Test Facility (TSF-21).

Based on environmental sampling, process knowledge, and work site use, the remedial investigation/feasibility study (RI/FS) (DOE-ID 1997) concluded that the known or suspected types of contamination at the work sites include metals (barium, cadmium, chromium, lead, mercury, and silver), volatile organic compounds ([VOCs] trichloroethene, 1,1,1-trichloroethane), semivolatile organic compounds ([SVOCs] bis[2-ethylhexyl] phthalate), polychlorinated biphenyls (PCBs), radionuclides (Cs-137, Co-60, Sr-90, and various isotopes of plutonium and uranium [DOE-ID 1997]). Since their installation, the three 37,850-L (10,000-gal) tanks have been used to store radioactive liquid wastes generated at TAN. Although the waste sent to the tanks was considered liquid, some oils and solids were also sent to the tanks, thereby creating two distinct phases (sludge and water). The RD/RA Work Plan Addendum 2 (DOE/NE-ID 2005) documents potential organic and inorganic contaminants for TSF-09. For Tanks V-1 through V-3, EDF-3868 summarizes the potential contaminants in two separate phases within each tank. However, the work plan addresses the methodology for operationally mixing these phases to a nominally consistent state prior to transfer and subsequent treatment.

The waste collected in the tanks was treated in the evaporator system located in TAN-616. Treatment residues were sent to the TSF injection well or the PM-2A Tanks at TSF-26. After the evaporator system in TAN-616 was shut down in 1972, waste stored in the TSF-09 Tanks was sent directly to the PM-2A Tanks. After 1975, waste that had accumulated in the TSF-09 Tanks was pumped out and shipped to the Idaho Chemical Processing Plant by tanker truck. Spills during tank operation and runoff from an adjacent cask storage pad reportedly contaminated surface soils surrounding the tank. In 1968, a large quantity of oil was discovered in Tank V-2; the tank was taken out of service. The oil was removed from Tank V-2 in 1981, and the liquid in the three tanks (V-1, V-2, and V-3) was removed in 1982. During removal of the liquid, approximately 6,434.5 L (1,700 gal) were accidentally allowed to drain onto the ground. The liquid puddled in a soil depression along the west side of the tank manways and flowed north out of the radiologically controlled area through a shallow ditch. Cleanup operations removed approximately 3.8 m^3 (128 ft^3) of radioactive soil in a 0.9-m^2 (10-ft^2) area north of the tanks and outside the posted RadCon zone, and the excavation was backfilled with clean soil. The tanks have not been used since the 1980s, although liquids (i.e., rainwater and snowmelt) have accidentally accumulated in Tank V-3 since the 1980s (DOE-ID 1997).

1.5.2 TSF-18, Tank V-9

The TSF-18 contaminated tank (Tank V-9) is situated in an open area southeast of TAN-616 and north of TAN-607, as shown on Figure 1-3. TSF-18 consists of a concrete sand filter that was removed and one conically-shaped UST.

The tank at TSF-18, referred to as Tank V-9 (see Figure 1-5), is a 1,514-L (400-gal) stainless-steel sump tank located approximately 2.1 m (7 ft) to 4.2 m (14 ft) below ground surface. Tank V-9 is a vertical, cylindrical tank with a conical shaped bottom. It has a 1.07 m (42 in.) diameter through the cylindrical portion for 1.7 m (5.5 ft), and then tapers down another 53.3 cm (21 in.) through the conical section. Tank V-9 is accessible by a 15.2-cm (6-in.) diameter riser that extends to the ground surface. Based on information obtained during the remedial investigation, the tank contains approximately 0.9 m (3 ft) of sludge, 0.9 m (3 ft) of liquid, and 0.3 m (1 ft) of headspace. (Blackmore 1998) estimated that the total volume of material in Tank V-9 was 1,216 L (320 gal). Radiation readings in the tank range from 9 mrem/hr on contact just inside the 15.2-cm (6-in.) riser to 10,500 mrem/hr just inside the tank.

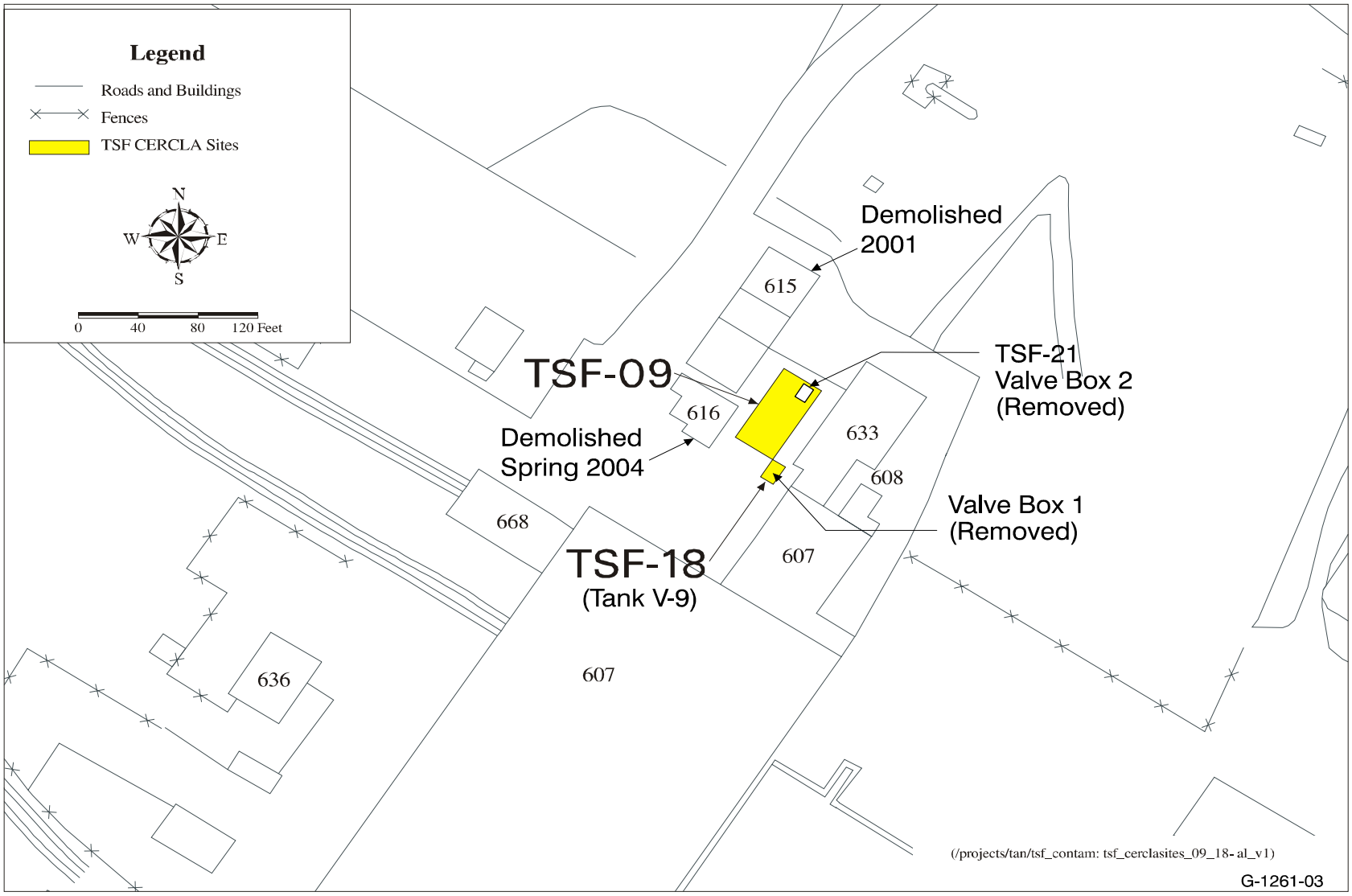


Figure 1-3. V-Tank sites at Test Area North.

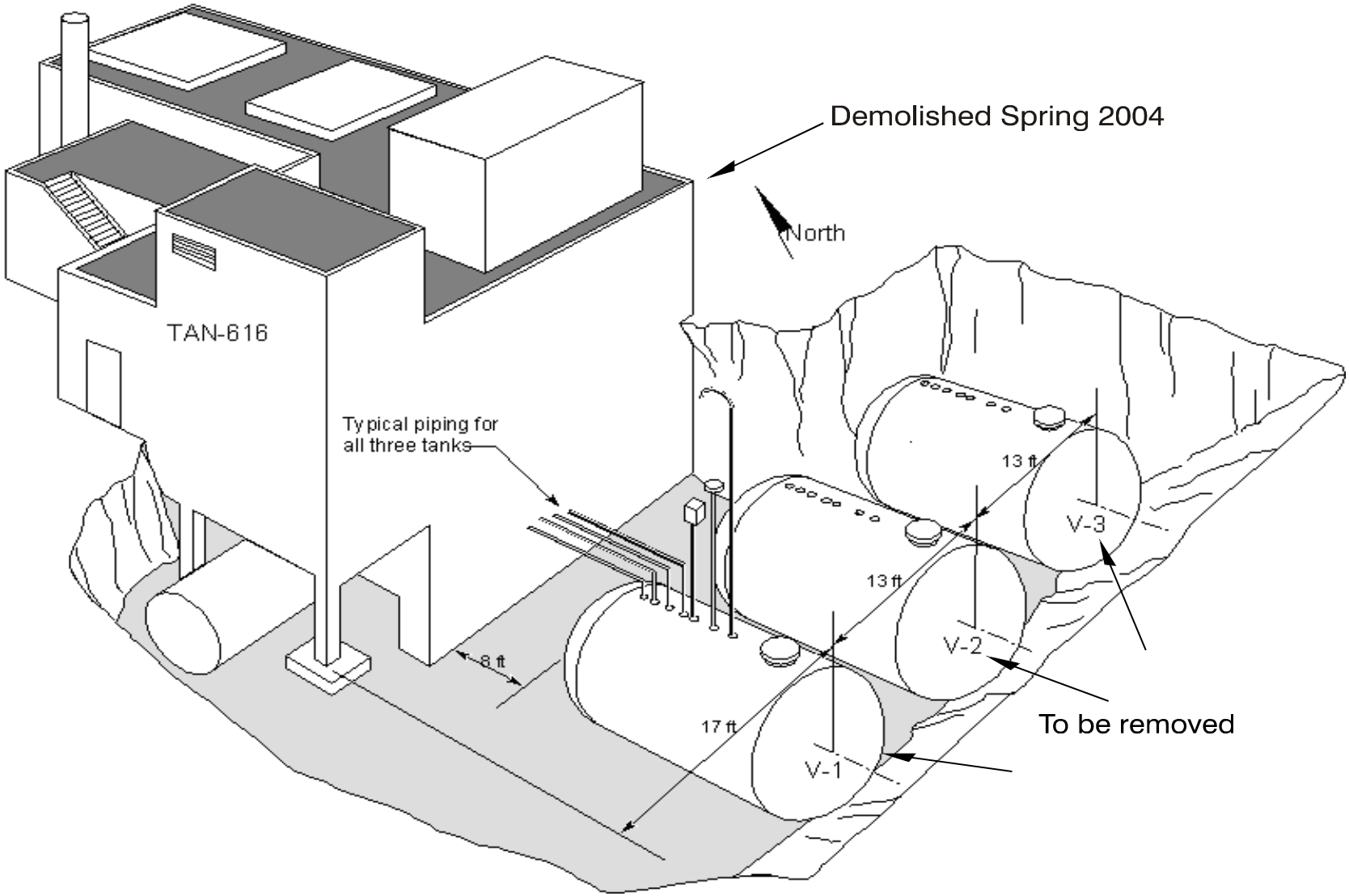


Figure 1-4. Diagram of TSF-09 (Tanks V-1, V-2, and V-3).

The tank was installed in the early 1950s and was indicated as a sump tank in "as-built" facility drawings. The visual evidence collected during the remedial investigation is consistent with the tank configuration shown in earlier "as-built" drawings (DOE-ID 1997). The internal visual evidence obtained with a remote camera during the remedial investigation also indicates that the tank is in good condition (DOE-ID 1997).

Results from sampling and analysis of Tank V-9 contents performed during the remedial investigation indicate that chemicals in the tank are very similar to those found in the tanks at TSF-09. High concentrations of Sr-90, Cs-137, Co-60, and trichloroethene detected during analysis are consistent with those found in the TSF-09 tanks during the Track 2 investigation in 1993 (INEL 1994). Section 2 summarizes these potential contaminants within this tank.

1.5.3 TSF-19, TAN-616 Caustic Tank

The process/product tank at TSF-19, referred to as the V-4 caustic tank was previously located beneath the TAN 616 caustic pump room floor in the south east corner of the facility. This system was used to store and transport 50% sodium hydroxide from the caustic tank (V-4) to the collecting tanks (V-1, V-2, and V-3) for pH adjustment.

In the summer of 2004, the process/product tank and piping was removed under the TAN-616 D&D action. The tank was placed in CERCLA storage for subsequent management and disposal under the V-Tanks remediation project. The process/product tank and associated piping had been deemed emptied to standard industrial practices and the pump was removed from the facility, when the facility was shut down in the 1970s. The 4,000-gal caustic tank (V-4) was documented as emptied to standard industrial practices (DOE-ID 1999). Given the system design, it was determined that it was not possible to contaminate the process/product caustic lines with waste from the collecting tanks (V-1, V-2, and V-3), (EDF-2879). In the fall of 2004 following tank removal, material in the caustic tank was sampled to provide for waste disposal profile development.

1.5.4 TSF-46, TAN-616 Soil

The TSF-46 site consists of soil within and around the footprint of TAN-616 (see Figure 1-6). The TAN-616 facility is a concrete structure located north of TAN-607. The building was within 2.4 m (8 ft) of the V-Tanks (V-1, V-2, and V-3) on the east and 18.2 m (60 ft) of TAN-607 on the south. The outside dimensions of the facility are 10.9 × 14 m (36 × 46 ft) and the building is approximately 7 m (23 ft) tall. TAN-616 was demolished during the spring of 2004.

In 1955, TAN-616 was constructed and contained an evaporator system, which was designed to concentrate radionuclide-contaminated liquid waste, mostly originating from the decontamination of equipment and facilities. The evaporator system operated from 1958 until the early 1970s; TAN-616 was taken out of service in 1972 because of evaporator vessel integrity problems and a temporary evaporator system installed above the holding tanks (PM-2A tanks, V-13 and V-14). From 1972 until 1975, wastewater might have been transferred via TAN-616 from the collecting tanks (V-1, V-2, and V-3) directly to the holding tanks, which at this time served as feed tanks to this temporary evaporator system (INEEL 2001).

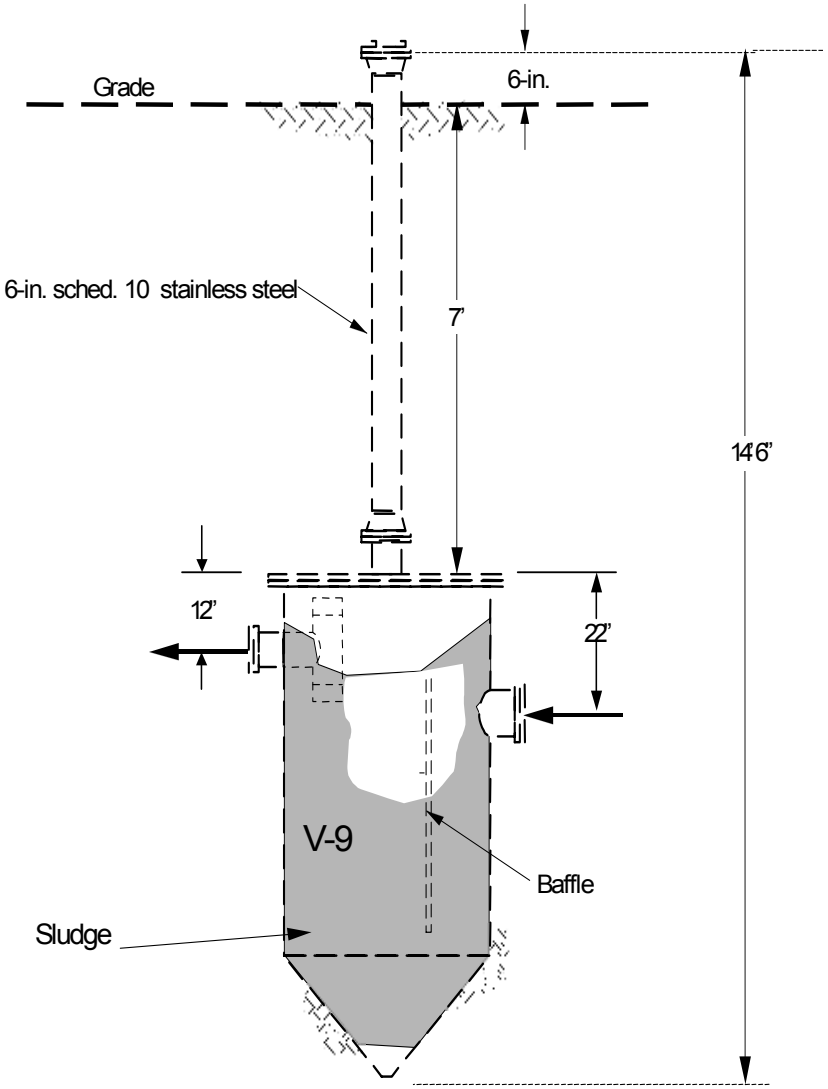


Figure 1-5. Diagram of TSF-18 (Tank V-9).

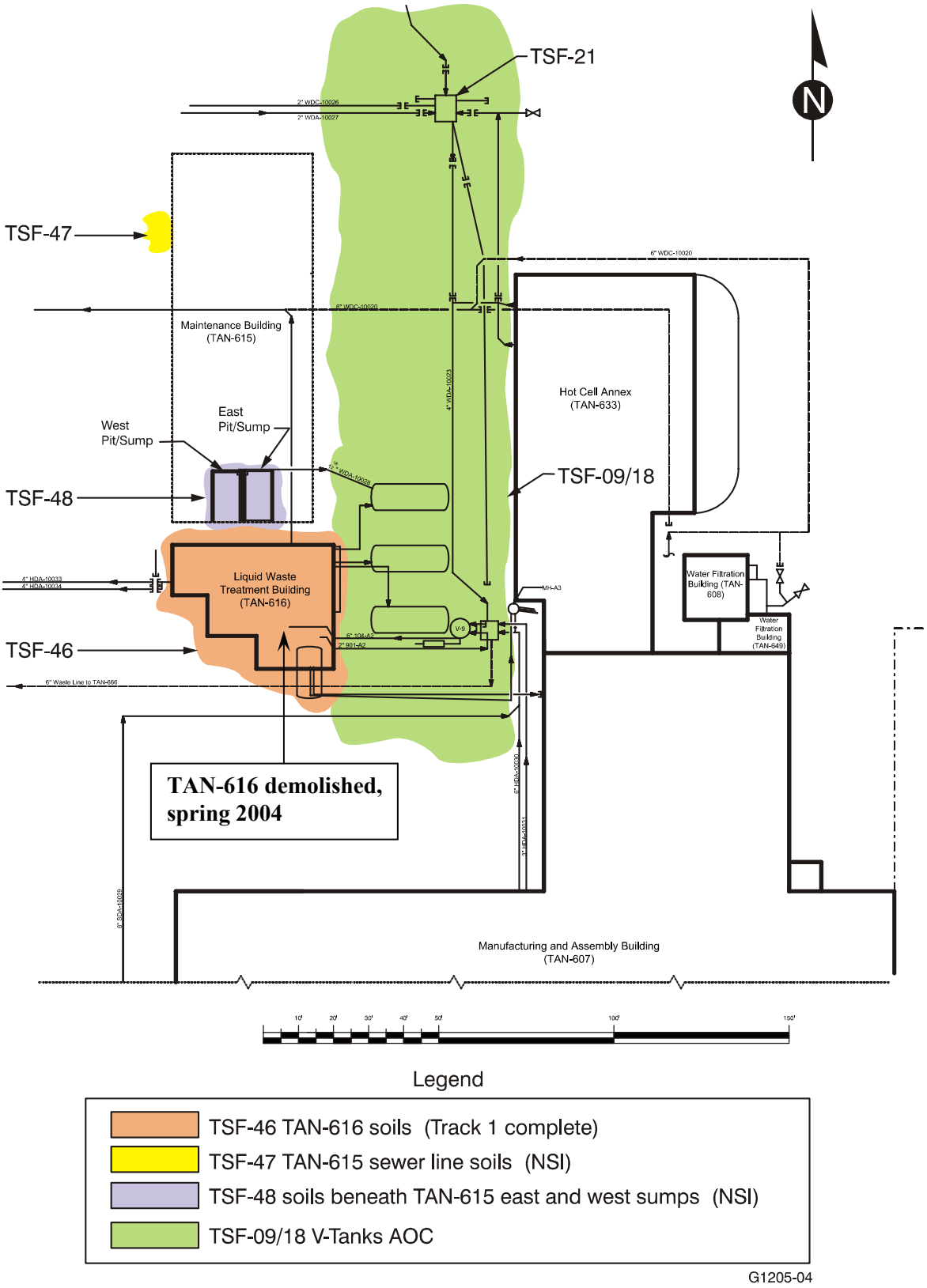


Figure 1-6. Location of TSF-46, -47, and –48.

Currently, TAN-616 and the Liquid Waste Treatment System are undergoing closure under the Hazardous Waste Management Act (HWMA) (Idaho Code § 39-4401 et seq.) and RCRA (42 USC § 6901 et seq.) and subsequent decontamination, decommissioning, and dismantlement. Soil underneath and around the facility has been excavated to support the demolition and removal of TAN-616, which is discussed further in the Notice of CERCLA Disturbance: "Excavation of Soils Surrounding TAN-616" (NCD-T04-03, Revision 2). Debris, including concrete rubble and paint chips, that becomes commingled with CERCLA soil has been sampled and managed along with the CERCLA soil.

1.5.5 TSF-47, TAN-615 Sewer Line Soils

The TSF-47 is a site of an apparent past sewer/industrial line leak that was discovered by deactivation, decontamination, and decommissioning crews in 2002 while excavating the TAN-615 building piers during dismantlement of the facility. The soil in the vicinity of the piping was damp and the sewer line was still active. A radiological survey performed on this soil identified contamination of 30,000 dpm.

The contaminated soil was 10–11 ft below ground surface approximately 5 ft outside the west wall of TAN-615, and just above where an east-west 6-in. cast iron sanitary sewer line tied into a concrete line. Based on INEEL Drawing No. 423666, the 6-in. sanitary sewer line upstream of the location of the contaminated soil has several sewer and industrial discharge feeder connections from several TAN buildings, including TAN-607, TAN-608, TAN-633, and TAN-615. Further excavation revealed that approximately 8 ft west from the tie-in point for the TAN-615 highbay drains, a crude concrete and plastic bag patch had been applied to the 6-in. drain line. At the time of discovery, the damaged section of pipe, as well as the section of pipe that contained the old tie-in from the highbay drains, was replaced with new pipe and the area backfilled with clean soil (INEEL 2004a).

1.5.6 TSF-48, TAN-615 East and West Pits/Sumps Area Soil

The TSF-48 site consists of the soil beneath and around two pits/sumps, now removed, that were located in the south end of TAN-615 approximately 6 ft away from the TAN-616 building's foundation walls. The TAN-615 building was originally constructed in 1955 to assemble and test nuclear reactors for the Aircraft Nuclear Propulsion Program, although the building was never used for this purpose.

The east pit/sump was located in the test area and was referred to as the test pit/sump. The pit was $8 \times 14 \times 8$ ft deep and contained a sump located in the northwest corner. The sump's dimensions were 12×12 in. with a depth of 3.8 ft. The test area originally was used for the testing of fuel assemblies. The east pit/sump and ancillary piping were reported to be out of service for their original use prior to 1971. Between 1971 and 1978, there was no known use of the east pit/sump, and TAN operations were in a shutdown mode during most of that time. Around 1978, the pit/sump was decontaminated and then converted to use as part of the LOFT control rod drive mechanism testing. From 1978 to about 1985, testing included filling and evacuating the east pit/sump with demineralized water. The pit/sump and ancillary piping were out of service by 1985 when assembly of LOFT fuel ceased.

The west pit/sump was located in the decontamination area and was referred to as the decontamination pit. The pit was $8 \times 14 \times 8$ ft deep and contained a sump located in the northeast corner. The sump's dimensions were 12×12 in. with a depth of 9 in. The west pit/sump and ancillary piping were reported to be out of service for their original use prior to 1971. The decontamination tanks, pump, a fume hood, and exhaust stack were removed before the early 1970s when the mission of the Actuator Facility was changed to support the LOFT Program. Between 1971 and 1976, there was no known use of the west pit/sump.

The TAN-615 building, including the east and west pits/sumps, was decontaminated and dismantled in 2002. The TAN-615 southeast and southwest pits were excavated to a depth of 11 to 12 ft and then backfilled to approximately 4 ft below ground surface. The project completion is described in *Final Report for the Decontamination and Decommissioning of the Test Area North-615* (INEEL 2003a).

1.6 V-Tanks Remediation Scope of Work

This HASP addresses Group 2 TSF-09 and TSF-18 activities outlined in the *Group 2 Remedial Design/Remedial Action Work Plan Addendum 2 for the TSF-09/18 V-Tanks and Contents Removal and Site Remediation Test Area North, Waste Area Group 1, Operable Unit 1-10* (DOE/NE-ID 2004c). In addition, this HASP governs all work at TSF-46, TSF-47, TSF-48 and other new sites at WAG 1.

This section provides a description of the work activities and interfaces. Additional design drawing details and technical specifications are provided in the Group 2 RD/RAWP Addendum 2 (DOE/NE-ID 2004c) and *Group 2 Remedial Design/Remedial Action Work Plan Addendum for the Assessment and Cleanup of V-Tank Area New Sites, for the Test Area North, Waste Area Group 1, Operable Unit 1-10* (DOE/NE-ID 2004b). The general sequence of activities will be as follows:

- Pre-mobilization activities
- Mobilization, site setup, and establishing controlled areas
- Phase 1 soil excavation and pipe removal
- Transfer equipment installation
- Miscellaneous waste steams and sample transfers
- System operability (SO) testing
- Management self-assessment
- ARA-16 waste transfer
- Tank content transfer/consolidation operations
- Installation of tank lift hardware, and introduction of solidification agent to emptied V-Tanks V-1, -2, and –3.
- V-9 final system piping removal
- Phase 2 excavation
- Placement of soil in soil storage area or roll-off containers
- Phase 1 Treatment (air sparging)
- Sampling of treated waste to confirm treatment goals are met
- Sampling of S-GAC and GAC units and consolidation tank content following air sparging, as required.
- Installation of the solidification system

- Individual removal and staging of emptied V-Tanks (V-1, -2, -3, and –9)
- Transfer of treated waste to the V-Tank containers V-1, -2, and -3
- Phase 3 excavation
- Confirmation and RCRA closure sampling
- Site backfilling.

These tasks are described in more detail below.

1.6.1 Premobilization

Prior to mobilization, as each task is undertaken, all associated documentation to support the work control for that given task will be prepared and approved. Job safety analyses, safe work permits, radiological work permits, as low as reasonably achievable (ALARA) reviews, confined space entry permits, operational procedures, and other work control forms will be prepared for each major portion of the remedial action. Additional activities include subsurface investigations to identify lines, utilities, and subsurface structures, preparation of lift plans, pre-job briefings, and equipment procurement. Remediation systems to be used to remove the tank contents will be simulated and tested by field personnel to ensure that all equipment operates properly and is configured as planned for field use. Waste transfer system mockups will also be used to provide comprehensive training to field operators.

1.6.2 Mobilization and Setup

Mobilization activities will begin with soil grubbing for the preparation of the temporary soil and tank storage area. Next, the area around the V-Tanks will be grubbed and graded to ensure that precipitation does not drain toward the V-Tank work area. Earth moving equipment, such as the trackhoe and Utilivac (or equivalent) will be parked in the V-Tank area close to where it will be needed for excavation.

Work control boundaries will be established around the V-Tank area. Bright-colored boundaries will be used to establish the traditional work zones, which are: the exclusion zone (Hot Zone), contamination reduction zone (decontamination zone), and the support (clean) zones. A level stable area for the crane will be established in the support zone to ensure safe lifting of the tanks.

The consolidation tank equipment will be skid mounted, including all tanks, secondary containment pan, pumps, etc. The consolidation tank skid will be placed in an all-weather enclosure which will be erected near the V-Tanks site.

A second all-weather enclosure will be constructed around the V-Tank area. Remaining equipment will be placed around the V-Tank area and within this all-weather enclosure.

1.6.3 Establish Site Access Controls

The V-Tank area is located within the TAN Technical Support Facility (TSF), which is fenced and patrolled to prevent unauthorized access. Specific site access control is provided in Section 7. Unauthorized personnel are not allowed site access and site conditions are controlled at all times during remediation activities. The V-Tank excavation and area of contamination will be roped to prevent inadvertent worker intrusion into the area, and appropriate signs will be placed to alert workers of the hazards. Skid mounted consolidation equipment will be located within the all-weather enclosure and will

be accessible via an equipment door. Transfer hardware and V-Tank access ports will be located within the second all-weather enclosure and will be accessible via an equipment door as well.

1.6.4 Phase 1 Soil Excavation

Excavation will be conducted in three phases: (Phase 1) uncover most of the soil above the tanks to allow for equipment installation, (Phase 2) remove soil to enable tank removal, and (Phase 3) remove soil in the general V-Tank area that is above the final remediation goals (FRG). Contaminated soils will be excavated to the extent indicated on the design drawings and specifications for the V-Tanks as shown in RD Group 2 RD/RAWP Addendum 2 (DOE/NE-ID 2004c). The excavation shall meet the minimum requirements of 29 CFR 1926 and PRD-22 or PRD-2014 "Excavation and Surface Penetrations." Any fall protection hazards associated with this excavation shall be addressed by PRD-2002 or PRD-5096, "Fall Protection." During this phase, pipes exposed during the excavation will also be cut, capped, and removed for disposal. Any residual liquids will be returned to the V-Tanks.

During Phase 1 excavation activities the soil will be removed to the top of each V-Tank. To ensure that pipes are not inadvertently breached, vacuum excavation and hand digging may be used to remove the soil. Because the slope is specified as 1.5:1 (horizontal to vertical), shoring for this Phase is not required.

Precautions such as water spray, wind monitoring, and visual observations by the RCT, industrial hygienist, or site health and safety officer will be used to prevent the generation of fugitive dust. Wind monitoring and visual observations to control fugitive dust will be performed by the industrial hygienist or the site health and safety officer. Personal protective equipment, when required, will be used as specified in Section 6, job safety analysis documents, and applicable radiation work permits, and as determined by the safety officer and/or the certified industrial hygienist present at the job site.

Equipment used for excavation of the contaminated soils can remain within the exclusion zone until excavation activities are complete. Barriers, such as tarps and containment pads, may be used to separate the equipment and vehicles that are used to haul excavated soil from the area to prevent the spread of contamination. Vehicle access to contaminated areas will be minimized. This strategy will minimize the spread of contamination and eliminate the need to perform any additional decontamination.

Designated TSF-09/18 system piping will be removed for CERCLA disposal as part of the project. Other piping in the V-Tank area exposed by the remediation activities will be managed by the appropriate responsible project (e.g., Brown Lines, etc.). Any pipe stubs resulting from line removals or isolations will be sealed from the environment. Residual liquids are anticipated in the TSF-09/18, V-9 outlet pipe. Residual liquids will be returned to the V-Tanks for transfer and/or introduced to the consolidation tanks for treatment with the V-Tank contents. Any remaining piping to be re-buried by project back-fill activities will be photographed and surveyed for TAN record.

1.6.5 Equipment Installation

Equipment will be installed in two areas: in the V-Tank area, and adjacent to the V-Tank site. The equipment to be installed at the V-Tank area includes pumps, piping, video monitoring equipment, suction and spray nozzles, off-gas equipment, and support equipment.

These items will be installed after Phase 1 soil excavation and covered by al all-weather enclosure structure.

The equipment to be installed on the consolidation and treatment pad located North of TAN-666 include the consolidation tank skid and associated pumps, pipes, valves, power distribution panels, off-gas system, etc., and the secondary containment pan. These items may be installed anytime after the pre-mobilization or prior to transporting the skid to the site. Additional Phase 1 and 2 treatment equipment may be positioned in the V-Tank and consolidation all-weather enclosure throughout the project as directed by the project manager.

Subsequent to waste transfer and consolidation activities, equipment will be installed to support the solidification process. Equipment will be installed on the "treatment pad" and will include items such as: a liquid containment basin, transfer lines from the consolidation tanks, scaffolding for access to the tanks on the flatbed transports, a dry-feed auger, and ancillary support systems.

The 10-hp recirculation pumps in the original system design experienced multiple mechanical seal failures during waste consolidation operations. An alternative pump type will be used to complete treatment and solidification. Each of the three recirculation pumps in the original design will be replaced with air-operated double diaphragm pumps (SPC-747). Installation of the new pumps will maintain the piping configuration and high-tank level alarm safety interlocks of the original design (Drawings P-2 and P-2D).

1.6.6 System Operability and Leak Testing

Individual components and assemblies will undergo system operability (SO) testing at the vendor or point of manufacture prior to delivery to the V-Tank project. The SO test will confirm the functionality and operability of the components and assemblies. The SO test will be conducted in accordance with established INL protocols, specifically MCP-3056, "Test Control". In addition, following equipment installation, the complete system will be subjected to an in-service leak test in accordance with ANSI B31.3 M Standards.

1.6.7 Management Self-Assessment

A management self-assessment (MSA) is a methodical process used by INL management to affirm that an activity is at a state of readiness to commence. This generally includes a thorough review of the safety basis and associated documentation, equipment, personnel, personnel training, and procedures to ensure the activity can proceed safely and in compliance with applicable requirements. The MSA will be conducted in accordance with the methods established in MCP-1126" Performing Management Self Assessments for Readiness." The MSA process culminates in a formal management decision to commence operations. Subsequent to any significant work stoppages, management will, at their discretion, require a re-assessment of readiness to continue operations.

1.6.8 Waste Removal Operation

Waste removal from the V-Tanks will occur through implementation of several steps as described below. All equipment will be in place and operational state prior to tank content removal.

1.6.9 Miscellaneous Waste and Sample Transfers

During the various V-Tank investigations, additional sample material was collected and archived in the event that completed analysis indicated the need for additional analysis. Many of the samples were not used for characterization or the treatability studies and are no longer needed by the project. The waste is contained in numerous sample containers of varying sizes. The OU 1-07B sludge and the returned

V-Tanks samples will be consolidated into drums or carboys prior to transferring the waste into the V-Tank sludge transfer system. Unaltered V-Tank samples will be added directly to the V-Tanks.

1.6.9.1 ARA-16 Waste. Waste from the ARA-16 remediation is currently located in the TAN-607 Hot Shop. The waste initially consisted of 4.5 gal of sludge and 312 gal of liquid. The waste is contaminated with a variety of organics, PCBs, and radionuclides. The waste has been removed from the ARA-16 tank and placed in a 500-gal high-integrity container (HIC). The bulk of the liquid portion was removed from the HIC by initial pumping through dewatering internal filters within the container. The volume of sludge remaining in the HIC is estimated to be comprised of 75.5 gal of water and the 4.5 gal of sludge from the ARA-16 tank. EDF-4928 gives the radiological and chemical characteristics of the sludge from the ARA-16 tank to be consolidated and treated. It is anticipated that these same characteristics will be present in the sludge remaining in the HIC. The radiation levels associated with this waste stream are 4.5 R at the bottom of the HIC with 2.5 R at the side. Therefore, appropriate shielding and PPE will be used in transferring the waste sludge from the HIC to the Consolidation Tanks.

1.6.9.2 OU 1-07B Sludge. The OU 1-07B sludge waste was generated in 1997 as part of sludge sampling activities performed in efforts to better characterize the waste material present within the TSF disposal well (TSF-05). There are 28 discrete sample vials partially filled with sludge material. The volume of sludge in the sample vials is estimated to be 3.2 gal (12 L) total.

These samples have been analyzed for toxicity characteristic leaching procedure (TCLP) with results indicating that no other waste codes apply to the sludge material. The major contaminants in the waste are trichloroethene (TCE), tetrachloroethene (PCE), and cis- and trans-dichloroethene (DCE). Other contaminants present in the sludge material include low levels of Sr-90 and Cs-137.

There are approximately 3.2 gal (12 L) of this waste that will be added to the V-Tank consolidation and treatment process. In order to remove the 3.2 gal of waste, an additional 11 gal of water is estimated to be needed to flush the material out of its containers.

1.6.9.3 Supernatant Removal. Tank V-3 contains a layer of sludge and approximately 7,000 gal of liquid. Approximately 6,000 gal of relatively clean supernatant will be suctioned out of the tank and pumped to Consolidation Tanks.

Supernatant will be withdrawn from Tank V-3 using suction pumps. These pumps are capable of pumping supernate from the top liquid surface in the V-Tanks to the Consolidation Tanks.

To prevent excessive quantities of sludge from being entrained in the supernatant, the suction hose will be attached to a floating suction strainer that will float on the supernatant surface. A video camera mounted inside the V-Tanks will enable operators to visually monitor the supernatant as it is drawn into the suction hose.

The supernatant will be used in subsequent steps for loosening the sludge in Tank V-9 and for rinsing the tanks after the sludge is removed.

1.6.9.4 V-1, V-2, and V-3 Sludge Removal. Following supernatant removal, the floating suction line and head will be removed from the tank. Sludge removal will begin in Tank V-3, followed by the other V-Tanks. The subsequent order will be determined by Facility and Project Management.

The removal operation will begin by recirculating the tank contents using a high-volume recirculation system that will get the sludge thoroughly mixed. Following thorough mixing, the waste will be transferred to the consolidation tanks. Operations will be monitored to determine the need for addition

tank rinsing. If required, this will be performed using the hand-held pressure wand. If additional rinsing capacity is required, the hand wand with spray nozzle assembly may be inserted into the tank for further high-flow rinse. Video cameras will assist the operators in positioning the suction and spray nozzles.

1.6.9.5 V-9 Sludge Removal. Due to the thicker consistency of the sludge in Tank V-9, removal of this sludge is expected to be more difficult than for the other tanks. Additionally, the baffle in Tank V-9 restricts access to sludge located between the inlet and the baffle. A video camera will be used to monitor the installation and operation of the sludge removal equipment.

V-9 sludge will be removed using spray (e.g., power washer and steam cleaner hardware) and specially designed suction nozzles (SPC-748 and Drawing 632045) to loosen and mix the material followed by pumping using a suction pump. These nozzles are expected to loosen and remove enough sludge from the conical bottom to cause the sludge located behind the baffle to collapse and fall to the conical bottom where it would be suctioned. If necessary, a hole will be cut in the top of Tank V-9 to allow better access to the inlet side of the baffle.

If Tank V-9 cannot be sufficiently cleaned to meet the extraction based debris treatment standard (40 CFR 268.45 Table 1 Section A.1.e), then either microencapsulation or macroencapsulation will be implemented as an alternative debris treatment standard as specified in the CFR prior to disposal at the ICDF. The specific measure to be implemented will be determined by the type of waste remaining in the tank. A summary of the two contingency options is provided; details are documented in EDF-5445, Rev 1, June 2005.

Option 1, Microencapsulation – If the nonremovable material remaining in the tank is predominantly debris (debris is greater than 50% by visual examination of total volume of waste in the tank including both sludge and all debris) then sufficient grout will be added to the tank to cover (encapsulate) the remaining waste material thereby, meeting the microencapsulation treatment standard. It is anticipated that this operation will be conducted in situ.

Option 2, Macroencapsulation If the nonremovable material remaining in the tank is predominantly sludge (sludge is greater than 50% by visual examination of the total volume of waste in the tank including both sludge and all debris) then the entire tank will be macroencapsulated prior to disposal at the ICDF. During macroencapsulation the interior void space within the tank will also be filled with grout. It is anticipated that this operation will be conducted ex situ in a pre-fabricated “culvert” type enclosure (DOE/NE-ID, 2005).

The sludge in Tank V-9 emits a significantly higher radiation field than the sludge in the other tanks. Therefore, to protect the workers from excessive radiation exposure, a carbon-steel shield plate will be placed over Tank V-9 for radiation shielding. Temporary shielding may also be used as required.

1.6.9.6 Tank Rinsing. Once the bulk of the sludge and remaining supernatant is removed from a V-Tank, the pressure wand will be manipulated to rinse the walls and floor of the V-Tank.

1.6.9.7 Visual Inspection. Upon completion of tank rinsing each tank will be visually inspected with the remote video camera to confirm that tank contents have been removed in accordance with the project expectations outlined in EDF-5443 “Projected Waste Profile Data for Treated V-Tanks Waste,” (addressing Tanks V-1, V-2, and V-3) and EDF-5445 “Projected Waste Profile Data for Emptied Tank V-9 and V-Tank Consolidation Tanks,” (which addresses Tank V-9). The tank suctioning and rinsing processes described above are easily expected to exceed the project expectations identified in these EDFs as the minimum acceptable.

1.6.10 Waste Consolidation

Three Consolidation Tanks will be located in the all-weather enclosure to receive the supernatant and sludge removed from the V-Tanks. One tank will store most of the supernatant to support subsequent treatment operations, while the other two tanks will store the sludge. After tank rinsing, the waste will be consolidated into each of the Consolidation Tanks for treatment (sparging). The design for each tank is identical to enhance operational flexibility. Each tank will be an 8,000-gal tank manufactured from stainless steel. Each Consolidation Tank is nominally 13.5 ft high and 10 ft in diameter with a dished bottom. This configuration reduces the footprint, enables thorough mixing, and minimizes areas that could entrap sludge. Due to the high radiation fields caused by the waste, the Consolidation Tanks area will be shielded. To prevent overfilling the Consolidation Tanks, each tank will be fitted with a level-indicating transducer that will alarm and terminate pump operation, thus terminating flow to the tank. Additionally, in-tank cameras will allow for monitoring of the transfer and mixing operations.

During initial waste transfer the system will include connections to an off-gas system that includes HEPA filtration and granulated activated carbon (GAC) adsorption units. The system is designed to maintain negative pressure and off-gas filtration on the V-Tanks and the consolidation tanks as well as the transfer system. The final transfer of waste from V-9 will be conducted without the GAC units in the off-gas system. Worker safety will be insured through monitoring of the work area by Industrial Hygiene personnel as summarized in Section 3.2 of this document and detailed in the operating procedures prior to work commencement.

1.6.10.1 Phase 2 Excavation and Tank Removal. Prior to Phase 2 soil excavations to allow for removal of Tanks V-1, V-2, and V-3, lifting fixtures will be installed on the top surface of the tanks. These fixtures will serve as interfaces for hoisting and rigging hardware to be installed in accordance with standard INL hoisting and rigging requirements (GDE-67; DOE-STD-1090-2004). The lifts will be designed and conducted by INL Central Engineering and D&D crafts. A Grove 220-ton crane (or equivalent) will be used to pick the tanks out of the excavation for placement in a staging area located north and east of the V-Tank excavation or directly onto flatbed transport trailers. Construction Drawings (C-18 and C-16, and associated FDCs) contained in the Group 2 RD/RAWP Addendum 2 (DOE/NE-ID 2004c) and EDF-6099 provide rigging details for each lift and tie-down concepts for securing the tanks for transport.

Tank V-9 will be removed utilizing slings, slung to tank structural flanges on the top or sides of the vessel (C-18). EDF-5595, "TSF-09/18 V-Tanks Remediation Tank Lifting Design," documents the design of the welded lifting lug to be attached to each of the V-Tanks. The lift brackets are design to lift the 15,000-lb tanks with 56,000 lb of solidified waste material inside. The tanks were analyzed and found to be capable of supporting this lifting operation.

An assumption of 750 lb of material (per tank) was provided by the V-tank project personnel to account for solidification material that may be added to stabilize any residual liquids remaining in the tanks. The sketch in EDF-6099 on page 15 shows the crane and pad locations with corresponding crane reach distances. The rigging identified in EDF-5595 and shown on drawing 628461 (with associated FDC) will not change and is still valid. The final determination of crane operations and rigging resides in the project generated lift plan as part of the work control documents.

V-9 piping will be cut, capped, or plugged and lifted out of the excavated hole. Although liquids in the pipe should have been removed in previous efforts, for safety and environmental protection, the project is anticipating the existence of liquids in the lines. Liquids in the lines will be captured and returned to the Consolidation Tanks.

Phase 2 excavation will occur after the sludge has been removed from the V-Tanks. Heavy equipment, such as a trackhoe with an extendable boom, will be used to remove sufficient additional soil around the V-Tanks to enable their removal. This depth will be approximately 23 ft below grade. A vacuum excavator, such as an Utilivac[a] (or equivalent), may also be used to excavate near the tanks and pipes. The slope of the Phase 2 excavation will be kept to a 1.5:1 slope so that shoring will not be required.

After the tanks are removed, the tank's exterior surface will be cleaned and decontaminated to enable compliant packaging and transportation or wrapped with required shipping material to meet this packaging and transport requirement. Tanks will be placed in a staging area, within the V-Tanks area of contamination (AOC), or onto trailers where they will be secured for transportation to ICDF for disposal. It is anticipated that transport trailers may be staged in a CERCLA storage area for a period of time prior to disposal contingent on the opening of the ICDF facility or other factors. This area will be designed by safety and radiation engineering support with proper controls for personnel following a thorough evaluation of hazards.

1.6.11 Waste Solidification

Following successful waste transfer, rinsing and inspections of the V-Tanks, preparations will commence for the tank exhumation and solidification processes. All liquid/sludge transfer hardware will be removed and penetrations in the tanks sealed. A passive HEPA unit will be installed directly on a designated tank flange to provide filtration of displaced air during subsequent operations. The HEPA filter will be sized to support solidification agent introduction, treated waste transfers and solidification cure, and void space filling at the ICDF. Approximately 800 pounds of powdered WaterWorksTM crystals will be gravity fed directly into each of V-Tanks V-1, -2, and –3 via the 20 in. man-way and the vertical sump line. Following introduction of crystals, personnel will physically spread the material over the base of the tank to provide a nominally even distribution of the product. Attempts will also be made to fill the tank sumps and vertical stand pipes. This will be accomplished with hand tools designed to reach the length of the tank from the man-way opening such that personnel will not have to enter any of the tanks. Crystals will also be introduces into tank V-9 if needed to eliminate free liquids.

The solidification process continues with the addition of more WaterWorksTM crystals mixed with the waste from the consolidation tanks. Waste/crystal integration is accomplished in a vortex mixer attached to a flange on top of the V Tanks. The waste is pumped through a hose to the vortex mixer, while the WaterWorks^{TM} crystals are delivered using an enclosed auger system.

1.6.12 Placement of Soil in Soil Storage Area or Roll-Off Containers

The soil removed during the first two excavation phases may be placed in a temporary staging area located approximately 200 ft north of the V-Tank area or directly into soil bags or roll-off containers. The Phase 1 and Phase 2 excavations are expected to be considerably slower than the Phase 3 excavation. The strategy is to manage soil in piles as well as in soil bags or roll-off containers to effectively contain potential contamination. The soil will be loaded into soil bags, roll-off containers or other equivalent transport containers and transported to the ICDF. Because a subcontractor may be used for the soil transport, the use of the soil storage area is a means to more efficiently utilize the transportation and disposal subcontractor.

The staging area will be bermed to prevent storm water movement into or out of the staging area. The staging area will not be lined; instead, an additional 6 in. of native soil will be removed when the contaminated soil is removed for transport to the ICDF. Construction details for the staging area are shown in Drawing C-9 of the Group 2 RD/RAWP Addendum 2 (DOE/NE-ID 2004c).

1.6.13 Confirmation and RCRA Closure Sampling

The V-Tank remediation project has two sets of complementary sampling requirements. One set of requirements addresses the RCRA closure of the V-Tanks and is driven by the HWMA/RCRA Closure Plan (DOE-ID 2004a) and the associated field-sampling plan, *Field Sampling Plan for the HWMA/RCRA Closure of the TAN/TSF Intermediate Level Radioactive Waste Feed Subsystem (V-Tanks)* (INEEL 2003b). The other set of sampling requirements addresses the CERCLA cleanup action and gathers data to ensure that the end-state condition of the V-Tank site meets the remedial action objectives.

The field sampling required calls for wide area screening of the area under remediation. In addition, soil samples will be collected under in the footprint of the V-Tanks, at Valve Pit 2, the 633-T area, and any areas showing evidence of release. Samples of the HEPA and granulated activated carbon media will also be collected for waste disposal purposes. Field sampling tasks are described further in the *Field Sampling Plan for the TSF-09/18 V-Tanks and Contents Removal and Site Remediation for Test Area North, Waste Area Group 1, Operable Unit 1-10* (ICP 2004b) (FSP). The FSP combines both the RCRA sampling requirements and the CERCLA sampling requirements.

1.6.14 Excavation Phase 3

Once the tanks are removed, the excavation will continue to remove soil that exceeds the final remediation goals. The area and depth of excavation are described in the Group 2 RD/RAWP Addendum 2 (DOE/NE-ID 2004c). Additional "New Sites" soils will be staged and managed with removed V-Tanks soils. The foundation pilings of Building TAN-633 are near the tank excavation. Therefore, excavation will be minimized so that the excavation and associated sloping requirements do not adversely impact the TAN-633 foundation. In addition, soil around the previous location of Valve Pit No. 2 will be excavated and sloped.

The TAN-616 D&D Project left part of a retaining wall, which was the pump room foundation. The remnants of this structure will be removed as part of the Phase 3 excavation. The material will be removed and handled identically to the V-Tank Project soil.

Soil removed during Phase 3 excavation will be transferred to the staging area or placed directly into soil bags or roll-off containers for shipment to the ICDF.

1.6.15 Site Backfill

The excavated area will be backfilled with pit-run material obtained from the TAN borrow-pit. The TAN borrow-pit has no known previous activities that would have contributed to radioactive or hazardous contaminants. The backfilled soil will be placed in 8-in. lifts and compacted with three passes of a roller or mechanical vibrator. An estimated total of 3,539 yd^3 of clean fill soil will be needed.

The excavated areas will be graveled only and not revegetated because this area will likely become disturbed during future TAN Completion Project activities.

1.6.16 Phase I Treatment – Air Sparging

Following transfer of waste into the consolidation tanks, Phase I treatment will be implemented. The treatment process will involve the recirculation of waste between the three consolidation tanks to achieve thorough mixing while the waste is mixed and air sparged in each of the three tanks. The 10-hp recirculation pumps in the original system design experienced multiple mechanical seal failures during waste consolidation operations. An alternative pump type will be used to complete treatment and

solidification. Each of the three recirculation pumps in the original design will be replaced with air-operated double diaphragm pumps (SPC-747). Installation of the new pumps will maintain the piping configuration and high-tank level alarm safety interlocks of the original design (Drawings P-2 and P-2D).

Sparging will be achieved by the controlled introduction of compressed air into each of the three consolidation tanks. In response to the safety and design issues identified with the original off-gas treatment system containing granulated activated carbon (GAC), an alternative off-gas system was evaluated including the option of not treating/removing the volatile organic contaminants from the off-gas. RCRA Subpart AA allows for controlling VOC emission releases below the specific threshold of 3 lb/hr as an alternative to treatment and removal. VOC releases with respect to the Clean Air Act were re-evaluated and determined to be compliant (EDF-6332). Worker exposure assessments were also conducted and determined to be below levels of concern (EDF-6327). Based on these assessments, the off-gas system design was modified without using GAC for VOC removal. Drawing 629153 depicts the off-gas system without VOC treatment/removal, while incorporating the necessary monitoring and controls to ensure emission limits are not exceeded.

VOC emissions will be measured continuously using an in-line photo-ionization detector (PID) that will be configured to provide a total volatile organic concentration in the off-gas. Total air flow will also be measured continuously. A data acquisition system will record the data on the air flow and the output from the PID. The data acquisition system will also make a calculation that will represent the instantaneous rate of volatile organic compounds and provide a totalization of the VOCs in terms of lb accumulated within each hour. If the total VOCs within any hour reaches an administrative control limit set below 3 lb/hr, the system will automatically close the air-sparge valve to the Consolidation Tanks. This control will ensure V-Tank VOC emissions remain in compliance with RCRA Subpart AA emissions release limits.

Worker Safety will be insured through routine monitoring of the general work area and the area immediately around the off-gas stack. Initial monitoring by the project IH will establish baseline levels which will be used to determine the frequency and type of monitoring to be conducted.

1.6.17 Post Phase I Treatment System Sampling

Samples of the treated consolidation tank waste will be collected from a port in the system for analysis as described in the *Field Sampling Plan for TSF-09/18 V-Tanks Phase I Treatment* (ICP-2004a). The apparatus consists primarily of a graduated vial/reservoir into which the desired volume of sample media will be introduced, in a controlled manner, from the main recirculation system. Sample bottles will in turn be filled from the base of the reservoir under a nonpressurized condition. Samples will be collected once the sparging process is deemed complete by project personnel.

Bottles will be positioned in a containment structure and placed in secondary containment while filling. Most likely, wipes or other absorbent in the bottom of the secondary containment will be used to absorb any drips/spilling. However, the specifics as to how samples will be collected and material controlled will be covered in facility work control.

This process may also be used to support waste sampling for process monitoring purposes.

Samples of the S-GAC filter media that was used during the transfer of the V-Tank contents, will be sampled as required by WGS to characterize them for disposal.

Following analysis, unaltered and altered consolidation tank samples collected after Phase I air sparging will be returned to the consolidation tank. This process will involve the use of existing system ports and a pump apparatus. Specifics as to how samples will be returned and material controlled will be covered in facility work control.

1.7 New Sites Remedial Actions

Excavation of contaminated soil will be performed if soil exceeds the final remediation goal and requires remedial action under the TAN Record of Decision. Earthwork at the remediation sites will include excavation and transportation of contaminated soil to the ICDF for disposal; excavation, hauling, and placement of backfill material; and grading and reclamation seeding of the excavated areas.

The New Sites soil remediation will be conducted in cooperation with the demolition of the TAN-616 facility and the excavation of TSF-18/09 V-Tank soil. The soil removed during the excavation phases will be placed in temporary staging areas in the vicinity of the V-Tanks area of contamination. The soil on the north, west, and south sides of TAN-616 (TSF-46 and TSF-48) will be excavated and stockpiled in the staging area to facilitate the demolition of the TAN-616 structure. Before soil excavation underneath the TAN-616 building, gamma screening using a field-calibrated portable high-purity germanium detector (HPGe) gamma spectrometer will be performed to identify radiologically contaminated hot spots. Soil that is contaminated above the final remediation goal will be remediated to a depth of 10 ft and if necessary stockpiled before shipment to the ICDF.

The contaminated soil around the sewer line (TSF-47) will be excavated in conjunction with the excavation of the V-Tank soil during either the Phase II or Phase III excavations. The contaminated soil around the sewer line will be sampled and if necessary stockpiled before shipment to the ICDF. The extent of the contamination around the sewer line will be determined using a HPGe gamma spectrometer.

Precautions such as water spray, wind monitoring, and visual observations will be used to prevent the generation of fugitive dust. Equipment necessary for excavation of the contaminated soil can remain within the decontamination control zones until completion of excavation activities. Barriers, such as tarps and containment pads, may be used to separate the equipment and vehicles that are used to haul excavated soil from the area to prevent the spread of contamination. This strategy will minimize the spread of contamination and eliminate the need to perform any additional decontamination.

The soil removed during the excavation of TSF-46, TSF 47 and TSF-48 will be placed in a temporary staging area located approximately 200 ft north of the V-Tank area or directly into roll-off containers. The strategy is to manage soil in piles as well as in soil bags or roll-off containers to effectively contain potential contamination. The soil will be loaded into soil bags, roll-off containers, or other equivalent transport containers and transported to the ICDF. Because a subcontractor may be used for the soil transport, the used of the soil storage area is a means to more efficiently utilize the transportation and disposal subcontractor.

1.8 New Sites Sampling Activities

Specific procedures are required to handle the samples collected during the V-Tank Area New Sites sampling activities to ensure that the data are representative of the soil within the TSF-46, TSF-47, and TSF-48 sites. The project FSP (DOE/NE-ID 2004a) provides detailed information on sampling activities. Limited soil samples will also be collected under HWMA/RCRA closure and used for assessment of the TSF-46 site, as outlined in the *Field Sampling Plan for the HWMA/RCRA Closure of the TAN-616 Liquid Waste Treatment Facility* (INEEL 2004a). Results from the samples collected under

the closure project will be used in conjunction with the samples collected under the V-Tank Area New Sites FSP to assess the area.

Sampling procedures will be discussed at the presampling meeting. The meeting discussion will include, but will not be limited to, the following: sampling activities for the day, responsibilities of team members, health and safety issues, and waste management. Any deviations from the sampling strategy presented in this FSP will be documented in the field-sampling logbook. All sample locations will be identified, staked, and clearly marked with the appropriate designations prior to sampling.

Sampling at the TSF-46, TSF-47, and TSF-48 sites will be done after remediation using a field-calibrated in situ HPGe gamma spectrometer. In situ gamma spectrometer systems are used in two modes: field and sample. Both modes will be used for sampling of the V-Tank Area New Sites. In field mode, the HPGe detector is used to conduct wide-area surveys of an area, usually a 10–50-ft diameter circle. In sample mode, the detectors are placed inside a field portable lead cave and sample pucks are collected and placed inside the lead cave in direct contact with the HPGe detector unit.

Sampling at the TSF-46, TSF-47, and TSF-48 sites will be done after remediation using a two-phased approach. Phase 1 will consist of gamma scans (wide-area surveys) to determine residual contamination levels and locate any hot spots. These wide-area surveys will cover essentially 100% of the excavated area. Results from these surveys will be used to determine if further remediation is needed and identify locations for collecting puck samples. If additional excavation is undertaken to remove areas with elevated levels of contamination, then these areas will be re-screened before collecting the puck samples.

Phase two will consist of collecting soil pucks in the excavated areas. After remediation has been deemed complete at TSF-46, TSF-47, and TSF-48, puck samples will be collected to assess the accuracy of the measurements obtained from the wide-area surveys and to verify that the residual soil concentration population mean at the 95% upper confidence level does not exceed the 23.3 pCi/g final remediation goal for Cs-137. If results from this sampling indicate the Cs-137 soil concentration population means exceed the final remediation goal, then additional excavation and subsequent puck re-sampling will be necessary. If the results from the puck samples confirm that the Cs-137 population mean does not exceed the final remediation goal at the 95% upper confidence limit, then remediation activities will be considered complete for the site and site restoration will proceed.

If areas are identified where there is evidence of a suspected release, post remediation soil samples at the bottom of the excavation will be collected and the samples analyzed for V-Tank soil contaminants. A risk analysis will be completed for these samples using the risk-based screening process outlined in the *Risk-Based Screening Approach for Waste Area Group 1 Soils* (INEEL 2004b) to determine if additional contaminants of concern are present and evaluate if a potential revision to the OU 1-10 Record of Decision final remediation goals is warranted.

Soil removed from the TSF-46, TSF-47, and TSF-48 sites either will be bagged or stockpiled at or near the excavation site, or at a CERCLA storage area, for subsequent disposal at the ICDF. Samples will be collected from each of the soil pile(s) (or collection of bagged soil), composited, and analyzed using conventional methods to characterize the soil for acceptance into ICDF. The *Waste Management Plan for the V-Tank Area New Sites, for Test Area North, Waste Area Group 1, Operable Unit 1-10* (ICP 2004c) describes management of soil and other waste generated from the V-Tank Area New Sites project.

Table 1-1 lists the planned sampling locations, the number of samples required, and the analyses that will be performed on each sample. These tables are subject to change based on results from field surveys; any changes will be noted in the sample logbook.

Table 1-1. Sample locations and analyses performed.

Site	Location	Number of Samples
TSF-46/48	Excavated soil from within and outside the TAN-616 footprint	Five composite samples from each collection of bags or pile of excavated soil
	Excavated soil and debris (concrete rubble) from within and outside the TAN-616 footprint	Five composite samples from each collection of bags or pile of excavated soil
	Additional bias samples	As needed based on specified field conditions (minimum of three)
	Confirmatory samples	To be determined based on results of field surveys
TSF-47	Excavated soil from around and beneath the sewer line	Five composite samples from each collection of bags or pile of excavated soil
	Additional bias samples	As needed based on specified field conditions (minimum of three)
	Confirmatory samples	To be determined based on results of field surveys
TSF-48	Excavated soil from beneath the TAN-615 sump area	See TSF-46.
	Confirmatory samples	Included in sampling of excavated soil from TSF-46

a. If additional contaminants of concern other than Cs-137 are identified from previous sampling efforts, characterization samples will be analyzed for those contaminants of concern as well.

TAN = Test Area North
TSF = Technical Support Facility

2. HAZARD IDENTIFICATION AND MITIGATION

The overall objective of this section is to identify existing and anticipated hazards associated with the remedial actions and to provide controls to eliminate or mitigate these hazards. These include the following:

- Evaluation of each project task to determine the safety hazards, radiological, chemical, and biological exposure potential to project personnel by all routes of entry
- Establishment of the necessary monitoring and sampling required to evaluate exposure and contamination levels, determine action levels to prevent exposures, and provide specific actions to be followed if action levels are reached
- Determination of necessary engineering controls, isolation methods, administrative controls, work practices, and (where these measures will not adequately control hazards) personal protective equipment (PPE) to further protect project personnel from hazards.

The magnitude of risk presented by these hazards to personnel entering controlled work zones is dependent on both the nature of tasks being performed and the proximity of personnel to the hazards (such as heavy equipment, tanks, or radioactive material). Engineering controls will be implemented (whenever possible) along with administrative controls, work practices, and PPE to further mitigate potential exposures and hazards.

This section describes the chemical, radiological, safety, and environmental hazards that personnel may encounter while conducting project tasks. Hazard mitigation provided in this section in combination with other work controls (e.g., technical procedures or work orders, job safety analysis, and Guide [GDE] –6212, "Hazard Mitigation Guide for Integrated Work Control Process") will also be used where applicable to eliminate or mitigate project hazards. All operational activities related to the consolidation tanks and related systems will be addressed in technical procedures and accompanying JSAs.

NOTE: *Subcontractor flow-down requirements such as those listed on the completed INEEL Form 540.10, "Safety Checklist of Subcontractor Requirements for On-Site Nonconstruction Work," Subcontractor Requirements Manual (TOC-59), and contract general and special conditions. Additionally, subcontractors are expected to take a proactive role in hazard identification and mitigation while conducting project tasks and report unmitigated hazards to the appropriate project point of contact. Subcontractors are responsible for meeting all applicable INL management control procedure (MCP), program requirement document (PRD), Voluntary Protection Program (VPP), and Integrated Safety Management System (ISMS) mitigative actions within the documented work controls.*

2.1 Chemical and Radiological Hazards and Mitigation

Personnel will be exposed to chemical and radiological hazards while conducting V-Tank remedial actions and field sampling activities at TAN, OU 1-10.

Table 2-1 lists the worker health-based chemical contaminants of concern that may be encountered while conducting project tasks. Since the source of contamination at TSF-46, TSF-47, and TSF-48 is anticipated to be from the V-Tanks, these constituents are based on the contaminants of concern in the V-Tank contents and the surrounding soil. However, not all the environmental risk-based contaminants of concern are listed in the Group 2 RD/RAWP (DOE-ID 2002) are on Table 2-1 since many do not pose a significant health hazard based on the matrix (for example metal in the liquid) or other factors. Table 2-2 summarizes each primary project task, associated hazards, and mitigation procedures.

Table 2-1. Evaluation of health-based contaminants of concern for V-Tank remediation tasks.

Material or Chemical (CAS No., and Ionization Potential)	Exposure Limit[a] (Permissible Exposure Limit and Threshold Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)[c]	Matrix or Source at Project Site	Exposure Potential (All Routes without Regard to PPE)
Aroclor-1260 (11096-82-5)	Not Available (nearly identical product – Aroclor-1254 [chlorodiphenyl 54%Cl]): 0.5 mg/m^3 – TLV 0.5 mg/m^3 – PEL	Inhalation, ingestion, skin and/or eye contact	Eye irritation, chloroacne, liver damage, reproductive effects	Skin, eyes, liver, reproductive organs	Not available Aroclor-1254 (chlorodipheny l 54% Cl)	V-1, V-2, V-3, V-9 solids; ARA-16 sludge waste	Low potential Maximum concentration detected = 138 mg/kg (sludge)
Arsenic, inorganic (7440-38-2)	0.01 mg/m^3 – TLV 10 µg/m^3 PEL TWA 5 µg/m^3 Action Level TWA (29 CFR 1910.1018, "Inorganic Arsenic")	inhalation, skin absorption, skin and/or eye contact ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin	Liver, kidneys, skin, lungs, lymphatic system	Yes – ACGIH Yes – NTP Yes – IARC Yes – OSHA	ARA-16 Sludge V-1, V-2, V-3, V-9 contents	Low potential Maximum concentration detected in soil = 19 mg/k
Benzene (71-43-2) IP: 9.24 eV	TLV: 0.5 ppm STEL: 2.5 ppm PEL: 1 ppm TWA STEL 5 ppm Action level: 0.5 ppm TWA (29 CFR 1910.1028, "Benzene")	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Yes – ACGIH Yes – NTP Yes – IARC Yes – OSHA	V-1, V-2, V-3, V-9 contents	Medium potential Maximum detected concentration is in V-9 at 524 mg/kg.

Table 2-1. (continued).

Material or Chemical (CAS No., and Ionization Potential)	Exposure Limit[a] (Permissible Exposure Limit and Threshold Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)[c]	Matrix or Source at Project Site	Exposure Potential (All Routes without Regard to PPE)
Beryllium (7440-41-7)	TLV: 0.002 mg/m^3 STEL: 0.01 mg/m^3 2004 Notice of intended changes: *TLV: 0.0002 mg/m^3 (inhalable fraction)* *STEL: None*	Inhalation, ingestion, contact hazard	Irritation of eyes and skin, chronic asbestosis, restricted pulmonary function	Eyes/respiratory tract	Yes – ACGIH Yes – NTP Yes – IARC Yes – OSHA	V-1, V-2, V-3, V-9 contents ARA-16 sludge	Medium potential Maximum detected concentration is in V-9 at 23.9 mg/kg.
Cadmium (7440-43-9)	TLV: 0.01 mg/m^3 Respirable: 0.002 mg/m^3 PEL: 5 µg/m^3 TWA Action level: 2.5 µg/m^3 TWA (29 CFR 1910.1027, "Cadmium")	Inhalation, ingestion	Pulmonary edema, dyspnea, cough, chest tightness, substernal pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia, emphysema, proteinuria, mild anemia	Respiratory system, kidneys, prostate, blood	Yes-NTP Yes-IARC A2-ACGIH Yes-OSHA	V-1, V-2, V-3, V-9 contents ARA-16 sludge	Low potential Maximum concentration detected is in V-9 at 29.2 mg/kg
Carbon Monoxide (6308-0)	50 PPM – PEL 25 PPM – TLV	Inhalation	Headache, confusion, nausea, dizziness, excessive exposure may be fatal	Blood oxygen carrying capacity	No	Fossil fueled equipment operation in areas with poor ventilation	Low-moderate potential associated with equipment operation and cutting operations
Acrylic Acrylate Resin (Trade Name: WaterWorks SP-400)	None established.	Inhalation, ingesttion	Ingestion of approx. 0.5 gallons may produce nausea. Dust particles may irritate eyes.	Eyes, respiratory system	No	Solidification agent, fugitive dust during handling	Low potential

Table 2-1. (continued).

Material or Chemical (CAS No., and Ionization Potential)	Exposure Limit[a] (Permissible Exposure Limit and Threshold Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)[c]	Matrix or Source at Project Site	Exposure Potential (All Routes without Regard to PPE)
Chloroform (67-66-3) IP: 11.42 eV	10 ppm – TLV	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; (potential occupational carcinogen)	Liver, kidneys, heart, eyes, skin, central nervous system	No	V-1, V-2, V-3, V-9 contents	Medium to high Maximum detected concentration is in V-9 at 252 mg/kg.
Chromium (7440-47-3)	0.5 mg/m^3 – TLV (metal & Cr III) 0.05 mg/m^3 – TLV (water-soluble) 0.01 mg/m^3 – TLV (Cr VI) 1 mg/m^3 – PEL (Cr metal) 0.5 mg/m^3 – PEL (Cr III)	Inhalation, ingestion, skin and/or eye contact	Eye and skin irritation, lung fibrosis	Eyes, skin, respiratory system	(Cr VI) Yes-NTP Yes-IARC A2-ACGIH Yes-OSHA	V-1 , V-2, V-3, V-9 contents, ARA-16 sludge	Low-moderate potential Maximum concentration detected = 2,920 mg/kg (V-9 sludge)
Lead (inorganic) (7439-92-1)	0.05 mg/m^3 – TLV PEL: 5o µg/m^3 TWA Action level: 30 µg/m^3 TWA Max 400 µg/m^3 /# hours per day (29 CFR 1910.1025, "Lead")	Inhalation, ingestion, contact hazard	Weakness, weight loss, anemia, nausea, vomiting, paralysis, constipation, insomnia, abdominal pain, kidney disease, eye irritation	GI tract, CNS, kidneys, blood, gingival tissue, eyes	No	V-1 , V-2, V-3 and V-9 contents, ARA-16 sludge	Low potential Maximum concentration detected = 541 mg/kg (sludge

Table 2-1. (continued).

Material or Chemical (CAS No., and Ionization Potential)	Exposure Limit[a] (Permissible Exposure Limit and Threshold Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)[c]	Matrix or Source at Project Site	Exposure Potential (All Routes without Regard to PPE)
Mercury (elemental) (7439-97-6)	0.025 mg/m^3 – TLV 0.1 mg/m^3 Ceiling – PEL	Inhalation, ingestion, skin and/or eye contact	Eye and skin irritation, chest pain, breathing difficulty, tremor, insomnia, headache, fatigue, gastrointestinal disturbance, weight loss	Eyes, skin, respiratory system, CNS, kidneys	No	V-1 , V-2, V-3 and V-9 contents, OU 1-07 B sludge, and ARA-16 sludge	Low-moderate potential Maximum concentration detected = 1,970 mg/kg (V-9 sludge)
Methylene Chloride (75-09-2) IP: 11.3 eV	50 ppm – TLV 100 ppm – STEL PEL: 25 ppm TWA STEL: 125 ppm TWA 1910.1052, (Methylene Chloride)	Inhalation, ingestion, skin and/or eye contact	Eye and skin irritation; fatigue, weakness, somnolence, lightheadedness; numbness, tingle limbs; nausea	Eyes, skin, cardiovascular system, CNS	Yes – NIOSH A3 - ACGIH	V-1 , V-2, V-3 and V-9 contents,	Medium potential Maximum detected concentration is in V-9 at 533 mg/kg.
Nickel (7440-02-0)	1.5 mg/m^3 – TLV (elemental) 0.1 mg/m^3 – TLV (soluble inorganic) 0.2 mg/m^3 – TLV (insoluble inorganic)	Inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis	Nasal cavities, lungs, skin	Insoluble inorganic Yes-ACGIH Yes-NTP Yes-IARC	V-1, V-2, V-3, V-9 contents OU 1-07B sludge, ARA-16 sludge	Low potential Maximum concentration detected = 396 mg/kg (V-9 sludge
Pyridine (110-86-1) IP: 9.27 eV	1 ppm - TLV	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, anxiety, dizziness, insomnia; nausea, anorexia; dermatitis; liver, kidney damage	Eyes, skin, central nervous system, liver, kidneys, gastrointestinal tract	No	V-1, V-2, V-3, V-9 contents OU 1-07B sludge	Medium potential Maximum detected concentration is in V-9 at 135 mg/kg.

Table 2-1. (continued).

Material or Chemical (CAS No., and Ionization Potential)	Exposure Limit[a] (Permissible Exposure Limit and Threshold Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)[c]	Matrix or Source at Project Site	Exposure Potential (All Routes without Regard to PPE)
Silica Crystalline (14808-46-1) Quartz (14808-60-7)	0-05 mg/m^3 – TLV (respirable) 10 mg/m^3 ———— (Respirable) % SiO_2 + 2 (29 CFR 1910.1000, Table Z-3)	Inhalation	Cough, difficulty breathing, decreased pulmonary function, irritated eyes	Eyes, respiratory system	A2 - ACGIH Yes - IARC	Native soil – airborne dust and particulates during soils excavation and handling	Low potential
Tetrachloroethene (PCE) (127-18-4) IP: 9.3 eV	25 ppm – TLV 100 ppm - STEL	Inhalation, ingestion, skin and/or eye contact	Eye and skin irritation; headache, vertigo; visual disturbance, fatigue, giddiness, tremor, somnolence, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury	Eyes, skin, respiratory system, heart, liver, kidneys, CNS	Yes – NIOSH	V-1, V-9 liquids, V-1, V-2, V-3, V-9 solids; OU 1-07B sludge,	Low potential Maximum concentration detected = 834 mg/kg (sludge)
Trichloroethene (TCE) (79-01-6) IP = 9.5 eV	50 ppm – TLV 100 ppm - STEL	Inhalation, ingestion, skin and/or eye contact	Eye and skin irritation; headache, vertigo; visual disturbance, fatigue, giddiness, tremor, somnolence, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury	Eyes, skin, respiratory system, heart, liver, kidneys, CNS	Yes – NIOSH	V-1, V-2, V-3, V-9 contents, OU 1-07 B sludgeARA-16 sludges	Moderate potential Maximum concentration detected = 26,200 mg/kg (V-9 sludge),

Table 2-1. (continued).

Material or Chemical (CAS No., and Ionization Potential)	Exposure Limit[a] (Permissible Exposure Limit and Threshold Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)[c]	Matrix or Source at Project Site	Exposure Potential (All Routes without Regard to PPE)
1,1,1-Trichloroethane (TCA) (71-55-6)IP = 11.1 eV	350 ppm – TLV 450 ppm - STEL	Inhalation, ingestion, skin and/or eye contact	Eye and skin irritation; headache, lassitude, CNS depressant/ depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eyes, skin, CNS, cardiovascular, liver	No	V-1, V-2, V-3, V-9 contents , ARA-16 sludge	Low-moderate potential Maximum concentration detected = 2,540 mg/kg (V-9 sludge)
Vinyl Chloride (75-01-4) IP: 9.99 eV	1 ppm – TLV	Inhalation, skin, and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities	Liver, central nervous system, blood, respiratory system, lymphatic system	A1-ACGIH Yes-NTP Yes-IARC	V-2, V-3, V-9 contents	Medium potential Maximum detected concentration is in V-9 at 253 mg/kg.
Dinitrotoluene (25321-14-6)	0.2 mg/m^3—TLV	Ih, Ig, Con, S	Eye and skin irritation, vertigo, fatigue, tremor, drowsiness, nausea, vomiting, dermatitis, cardiac arrhythmias, liver injury	Eyes, skin, respiratory system, heart, liver, kidneys, CNS, reproductive	ACGIH—A3[c]	V-1, V2, V-3 , and V-9 contents	Low-moderate potential Maximum detected concentration is in V-1 at 135 mg/kg (V-9 sludge).
Hexachlorobutadiene (87-68-3)	0.02 ppm—TLV	Ih, Ig, Con, S	Eye and skin irritation, vertigo, fatigue, tremor, drowsiness, nausea, vomiting, dermatitis, cardiac arrhythmias, liver injury	Eyes, skin, respiratory system, heart, liver, kidneys, CNS	ACGI—A3[c]	V-1, V2, V-3 , and V-9 contents	Low-moderate potential Maximum detected concentration is in V-9 at 135 mg/kg.

Table 2-1. (continued).

Material or Chemical (CAS No., and Ionization Potential)	Exposure Limit[a] (Permissible Exposure Limit and Threshold Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)[c]	Matrix or Source at Project Site	Exposure Potential (All Routes without Regard to PPE)
Bis (2-ethylhexyl) phthalate (117-81-7)	5 mg/m^3—TLV 5 mg/m^3—PEL	Ih, Ig, Con	Eye and mucous membrane irritation	Eyes, respiratory system, CNS, liver, reproductive system, GI tract	ACGIH—A3[c] IARC—2B[c] NTP—R[c]	Tank and piping contents	Low potential Maximum concentration detected = 1,270 mg/kg (sludge)
Radionuclides – Co-60, Cs-137, Sr-90 (dominant species)							
Radionuclides (whole-body exposure)	ALARA, dose limit, and limiting conditions in accordance with radiological work permit (RWP) Alarming direct reading dosimetry (DRD) at RWP defined set point	Whole body	Acute gastrointestinal disorders, bacterial infections, hemorrhaging, anemia, loss of body fluids, cataracts, temporary sterility Chronic cancer, pre-cancerous lesions, benign tumors, cataracts, skin changes, congenital defects	Blood-forming cells, gastrointestinal tract, and rapidly dividing cells	Yes – IARC	Sources at V-1, V-2, V-3, V-9, associated piping and liquids, contaminated soils, miscellaneous samples. *See footnote d regarding criticality*.	High exposure potential Low levels detected in soil samples High levels detected in V-Tank sludge.
Radionuclides (fixed and removable surface contamination)	ALARA, limiting conditions in accordance with RWP Posting of contamination areas in accordance with PRD-183	Inhalation, ingestion, absorption (broken or damaged skin)	High counts on portable air samplers, direct reading instruments, swipe counter (scaler), and alarm indication on PCM	GI tract, ionization of internal tissue through uptake of radionuclides	Yes – IARC	Sources at V-1, V-2, V-3, V-9, associated piping and liquids, contaminated soils, miscellaneous samples	

Table 2-1. (continued).

Material or Chemical (CAS No., and Ionization Potential)	Exposure Limit[a] (Permissible Exposure Limit and Threshold Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)[c]	Matrix or Source at Project Site	Exposure Potential (All Routes without Regard to PPE)

a. Sources: *Threshold Limit Values Booklet* (American Conference of Government Industrial Hygienists [ACGIH 2004]) and substance-specific standards (29 CFR 1910.1000, Tables Z-1, Z-2, Z-3).

b. These include (1) nervous system: dizziness, nausea, and lightheadedness; (2) dermis: rashes, itching, and redness; (3) respiratory system: respiratory effects; and, (4) eyes: tearing and irritation.

c. If yes, identify agency and appropriate designation (i.e., ACGIH A1 or A2; National Institute of Occupational Safety and Health (NIOSH) ; Occupational Safety and Health Administration (OSHA); International Agency for Research on Cancer (IARC); National Toxicology Program (NTP).

d. In 1998, an evaluation of criticality issues associated with TSF-09 determined that there is not sufficient radionuclide mass in each of the V-1, V-2, and V-3 tanks to sustain a critical reaction (Blackmore 1998). Following additional Tank V-9 sampling, the criticality issues were analyzed again in 2003 with no criticality concern being identified as documented in EDF-3477, "Criticality Concerns Associated with the TAN V-Tanks."

ALARA = as low as reasonably achievable
RWP = radiological work permit
TWA = time-weighted average
IP = ionization potential
STEL = short-term exposure limit
TLV = threshold limit value
NIOSH = National Institute of Occupational Safety and Health
PEL = permissible exposure limit

Table 2-2. Summary of V-Tank remedial action activities, associated hazards, and mitigation.

ACTIVITY OR TASK: - TASK 1	
V-Tank Remediation Task 1 – Mobilization and Site Preparation	
• Mobilize equipment and materials to the site • Setup and establish controlled zones and soil storage area (SSA) • Mobilize heavy equipment • Conduct system operability (SO) testing	
Task 1 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 1.1:	Heavy equipment movement/vehicle traffic/material placement, staging SSA high-density polyethylene (HDPE) cover/ —struck-by and caught-between hazards, overhead equipment obstructions
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.5, Powered Equipment and Tools Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 1.2:	Tripping hazards/working-walking surfaces—uneven, unstable or steep terrain, rocks and debris, piping, cables and lines on ground
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces
Hazard 1.3:	Pinch points, sharp surfaces, overhead hazards—Materials handling, usage of hand tools, walking around equipment, and piping
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Backstrain Section 2.2.3, Working and Walking Surfaces Section 2.2.13, Overhead Objects
Hazard 1.4:	Lifting and back strain—material handling and movement, setting up controlled area, SSA HDPE handling
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders

Table 2-2. (continued).

Hazard 1.5:	Combustible/flammable liquids—fueling of equipment on site, combustible materials
Mitigation	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section)
	Section 2.2.7, Fire Hazards and Material Hazards
Task 1 – Mobilization and Site Preparation	
Hazard 1.6:	Stored energy sources—buried utilities, energized cables in conduit on ground, overhead lines, raised equipment position, stacked/stored materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections)
	Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards
Hazard 1.7:	Chemical and Radiological Contaminants—area in and around V-Tanks and installed systems during SO testing, consolidation tank trailer locations
Mitigation:	(Level D PPE [Section 5] in conjunction with implementing hazards controls in the following section)
	Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, exposure Monitoring and Control Radiological Work Permit (as required)
Hazard 1.8:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections)
	Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard 1.9:	Noise—Heavy equipment operation, hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section)
	Section 2.3.1, Noise

Table 2-2. (continued).

ACTIVITY OR TASK: TASK 2	
V-Tank Remediation Task 2 – Phase 1 Soil Excavation, Equipment Installation, and Placement of Soil in SSA, soil bags, or roll-off containers	
• Excavate Phase 1 soils to the soil storage area (SSA), soil bags, or roll-off containers • Install equipment at the TSF-18/-09 sites and make all connections of consolidation tanks and piping • Transfer Phase 1 excavated soils to the SSA, soil bags, or roll-off containers	
Task 2 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 2.1:	Heavy equipment movement/vehicle traffic/material placement, —struck-by and caught-between hazards, overhead equipment obstructions
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.5, Powered Equipment and Tools Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 2.2:	Excavation—heavy equipment operation, struck-by/caught-between, swing radius, staged spoil piles, sloped excavation, excavation in close proximity to piping systems/tanks. Tipping of heavy equipment.
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 2.3:	Tripping hazards/working-walking surfaces/fall hazard—uneven, unstable or steep terrain; open excavation; rocks and debris; piping, cables and lines on ground; V-Tank surface and associated piping; water/frost on HDPE cover
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces Section 2.2.4, Elevated Work Areas Section 2.2.11, Excavation, Surface Penetrations, and Outages

Table 2-2. (continued).

Hazard 2.4:	Pinch points, sharp surfaces, overhead hazards—Materials handling, installing equipment, usage of hand tools, walking around equipment, piping and tanks
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections)
	Section 2.2.1, Material Handling and Backstrain Section 2.2.3, Working and Walking Surfaces Section 2.2.13, Overhead Objects Operation Technical procedures or work orders and associated JSAs
Hazard 2.5:	Lifting and back strain—equipment material handling/movement/installation, handling HDPE cover
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections)
	Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 2.6:	Combustible/flammable liquids—fueling of equipment on site, combustible materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section)
	Section 2.2.7, Fire Hazards and Material Hazards
Hazard 2.7:	Stored energy sources—buried utilities, energized cables in conduit on ground, overhead lines, raised equipment position, stacked/stored materials, bungee cords that secure tarps on roll-off containers, electrical and burn hazards from heat sealer.
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections)
	Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards
Hazard 2.8:	Chemical and Radiological Contaminants—potentially encountered in soils around V-Tanks and surrounding piping
Mitigation:	(Level D+ PPE [Section 5] in conjunction with implementing hazards controls in the following section)
	Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Operations Technical procedures or work orders and associated JSAs Radiological Work Permit(s)

Table 2-2. (continued).

Hazard 2.9:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard 2.10:	Noise—Heavy equipment operation, hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.3.1, Noise
Hazard 2.11	Dust—Placement of soil into SSA, soil bags, or roll-off containers, heavy equipment movement.
Mitigation:	Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.2.10 Heavy Equipment and Moving Machinery Spray-water application to settle dust. Do not apply excessively. In high wind conditions, field supervision to determine if work should continue.
ACTIVITY OR TASKS: TASK 3-WASTE REMOVAL	
V-Tank Remediation Task 3 – Waste Removal	
• Supernatant Removal and Transfer • Sludge Removal • Tank Rinsing • Inspection	
Task 3 -Associated Hazards or Hazardous Agent and Mitigation	
Hazard 3.1:	Tripping hazards/working-walking surfaces—uneven, unstable or steep terrain, rocks and debris, open excavation, piping, cables, pumps, and lines on ground, tank surface
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces Section 2.2.11, Excavation, Surface Penetrations, and Outages
Hazard 3.2:	Pinch points, sharp surfaces, overhead hazards—Materials handling, usage of hand tools, walking around equipment, piping and tanks
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Backstrain Section 2.2.3, Working and Walking Surfaces Section 2.2.13, Overhead Objects Operations Technical procedures or work orders and associated job safety analysis (JSAs)

Table 2-2. (continued).

Hazard 3.3:	Lifting and back strain—material handling and movement, handling tank wands and sprayer poles
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections)
	Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 3.4:	Stored energy sources—Air compressor, pressurized lines, electrical cords and equipment
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections)
	Section 2.2.8, Pressurized Systems Section 2.2.6, Electrical Hazards and Energized Systems Operations technical procedures or work orders and associated JSAs
Hazard 3.5:	Chemical and Radiological Contaminants—Material removed from tanks, lines containing/transferring material, pumps, and lines/consolidation tanks
Mitigation:	(Level C/D+ PPE [Section 5] in conjunction with implementing hazards controls in the following section)
	Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Operations Technical procedures and associated JSAs Radiological Work Permit(s) Temporary Radiological Shielding (as required by RWP)
Hazard 3.6:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections)
	Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard 3.7:	Noise—Heavy equipment operation, hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section)
	Section 2.3.1, Noise
Hazard 3.8:	Heat Stress—Performing work tasks in Level C PPE, consolidation tank operations
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section)
	Section 2.3.2, Temperature and Ultraviolet Light Hazards

Table 2-2. (continued).

ACTIVITY OR TASK: TASK 4 – PHASE 2 SOIL EXCAVATION	
• Excavate Remaining Soil Around Tanks • Haul and/or Place Removed Soil in SSA • Place Soil on Final Transport Containers	
V-Tank Remediation Task 4 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 4.1:	Heavy equipment movement/vehicle traffic/material placement, —struck-by and caught-between hazards, overhead equipment obstructions, hoisting and rigging (potential if soil bags are used)
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.5, Powered Equipment and Tools Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 4.2:	Excavation—heavy equipment operation, struck-by/caught-between, swing radius, staged spoil piles, sloped excavation, subsidence, excavation in close proximity to piping systems/tanks
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects and Hazards Section 2.2.16, Subsidence Section 7, Site Security and Control
Hazard 4.3:	Tripping hazards/working-walking surfaces/fall hazard—uneven, unstable or steep terrain; open excavation; rocks and debris; piping, cables and lines on ground; V-Tank surface and associated piping; water/frost on HDPE cover, subsidence
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces Section 2.2.4, Elevated Work Areas Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.16, Subsidence
Hazard 4.4:	Pinch points, sharp surfaces, overhead hazards—Materials handling, usage of hand tools, walking around equipment, piping and tank, soil vacuum extraction operations, haul truck operations
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Backstrain Section 2.2.3, Working and Walking Surfaces Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects Vacuum extractor unit operation technical procedure(s) and associated JSA(s)

Table 2-2. (continued).

Hazard 4.5:	Lifting and back strain—equipment material handling/movement/installation, handling HDPE cover, vacuum extractor setup and operation, soil bag handling
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 4.6:	Combustible/flammable liquids—fueling of equipment on site, combustible materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.2.7, Fire Hazards and Material Hazards
Hazard 4.7:	Stored energy sources—buried utilities, energized cables in conduit on ground, overhead lines, raised equipment position, stacked/stored materials, electrical cords, high negatively pressurized vacuum extraction system
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections) Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.12, Hoisting and Rigging of Equipment (if required to rig and hoist vacuum line/soil bags) Section 2.2.13, Overhead Objects and Hazards Vacuum extractor unit operation technical procedure(s) and associated JSA(s)
Hazard 4.8:	Chemical and Radiological Contaminants—potentially encountered in soils around V-Tanks and surrounding piping
Mitigation:	(Level D+/C PPE [Section 5] in conjunction with implementing hazards controls in the following section) Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Vacuum extractor unit operation technical procedure(s) and associated JSA(s) (HEPA filtered bag filter) Radiological Work Permit(s)
Hazard 4.9:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard: 4.10:	Noise—Heavy equipment/soil vacuum extraction operation, hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.3.1, Noise

Table 2-2. (continued).

ACTIVITY OR TASK: TASK 5 – SOLIDIFICATION PROCESS HARDWARE INSTALLATION AND TREATMENT	
• Introduce WaterWorks Crystals™ and installation of HEPA filtration system into emptied V-Tanks V-1, -2, and -3 • Install solidification process hardware • Transfer and solidify waste in V-Tank containers	
V-Tank Remediation Task 5 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 5.1:	Heavy equipment movement/vehicle traffic/material placement, —struck-by and caught-between hazards, overhead equipment obstructions, hoisting and rigging (possibly used to position manifold and lift apparatus, used for solidification agent introduction)
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) NOTE: WELDING OF LIFT APPARATUS WILL BE PERFORMED Section 2.2.5, Powered Equipment and Tools Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 5.2:	Tripping hazards/working-walking surfaces/fall hazard—uneven, unstable or steep terrain; open excavation; rocks and debris; piping, cables and lines on ground; V-Tank surface and associated piping; water/frost on HDPE cover, subsidence
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces Section 2.2.4, Elevated Work Areas Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.16, Subsidence
Hazard 5.3:	Pinch points, sharp surfaces, overhead hazards—Materials handling, usage of hand tools, walking around equipment, piping and tank, soil vacuum extraction operations, haul truck operations
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Backstrain Section 2.2.3, Working and Walking Surfaces Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects Vacuum extractor unit operation technical procedure(s) and associated JSA(s)
Hazard 5.4:	Lifting and back strain—equipment material handling/movement/installation, handling HDPE cover, solidification agent bag handling
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 5.5:	Combustible/flammable liquids—fueling of equipment on site, combustible materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.2.7, Fire Hazards and Material Hazards

Table 2-2. (continued).

Hazard 5.6:	Stored energy sources—buried utilities, energized cables in conduit on ground, overhead lines, raised equipment position, stacked/stored materials, electrical cords.
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections) Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.12, Hoisting and Rigging of Equipment (if required to rig and hoist solidification agent bags) Section 2.2.13, Overhead Objects and Hazards Crane and/or other equipment used for material lifts.
Hazard 5.7:	Chemical and Radiological Contaminants—potentially encountered in soils around V-Tanks and surrounding piping
Mitigation:	(Level D+/C PPE [Section 5] in conjunction with implementing hazards controls in the following section) Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Vacuum extractor unit operation technical procedure(s) and associated JSA(s) (HEPA filtered bag filter) Radiological Work Permit(s)
Hazard 5.8:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard: 5.9:	Noise—Heavy equipment operation, hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.3.1, Noise

Table 2-2. (continued).

ACTIVITY OR TASK: TASK 6-TANK AND PIPING REMOVAL, OUTER TANK SURFACE DECONTAMINATION	
• Attach Rigging or Lifting Points to Tanks • Hoist Tanks and Place in Designated Area • Decontaminate Outer Tank Surface and place on trailer for transport to ICDF • Cap and Remove Existing Lines	
V-Tank Remediation Task 6 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 6.1:	Heavy equipment movement/vehicle traffic/material placement, hoisting and rigging —struck-by and caught-between hazards, overhead equipment obstructions, overhead and suspended loads
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.5, Powered Equipment and Tools Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 6.2:	Tripping hazards/working-walking surfaces—uneven, unstable or steep terrain, rocks and debris, open excavation, piping, cables, pumps, and lines on ground, walking on tank surface, tank decontamination surface (if liquids are used)
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 7, Site Security and Control
Hazard 6.3:	Pinch points, sharp surfaces, cutting tools, overhead hazards—Rigging, materials handling, usage of hand tools, walking around equipment, piping and tanks, suspended loads
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Backstrain Section 2.2.3, Working and Walking Surfaces Section 2.2.5, Powered Equipment and Tools Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects
Hazard 6.4:	Lifting and back strain—material handling and movement, cutting/capping/handling piping, tank decontamination tasks
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders

Table 2-2. (continued).

Hazard 6.5:	Stored energy sources—Suspended loads, staged equipment and piping, round tanks, electrical cords and equipment
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections)
	Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.12, Hoisting and Rigging of Equipment Stops or chocks under tanks to prevent rolling
Hazard 6.6:	Chemical and Radiological Contaminants—Contact or exposure to tank surface and piping content
Mitigation:	(Level C/D+ PPE [Section 5] in conjunction with implementing hazards controls in the following section)
	Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Temporary Radiological Shielding (as required by RWP) Radiological Work Permit(s)
Hazard 6.7:	Elevated Work Areas—Open excavations, working from tanks or other elevated areas greater than 6-ft above surface, consolidation tank trailer work at elevation
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections)
	Section 2.2.4, Elevated Work Areas
Hazard 6.8:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections)
	Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard 6.9:	Noise—Hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section)
	Section 2.3.1, Noise
Hazard 6.10:	Heat Stress—Performing work tasks in Level C PPE
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section)
	Section 2.3.2, Temperature and Ultraviolet Light Hazards

Table 2-2. (continued).

ACTIVITY OR TASK: TASK 7 – MISCELLANEOUS WASTE and ALTERED/UNALTERED SAMPLE TRANSFER AND RETURNS	
• Transfer ARA-16 Materials to Consolidation Tank No. 3 (or predetermined waste container) • Return TSF-05 and WAG 1 Laboratory Samples to Consolidation Tank No. 3 (or predetermined waste container) • Return TAN D&D VCO Waste to Consolidation Tank No. 3 (or predetermined waste container) • Return altered/unaltered consolidation tank samples back to consolidation tank **NOTE:** *The miscellaneous waste from ARA-16, TSF-05 returned samples, WAG 1 laboratory samples, TAN D&D VCO waste will be transferred to Consolidation Tank No. 3 after V-Tank sludge transfer and rinsing operations are complete. Additional wastes would be consolidated with the V-Tanks waste as treated as one relatively homogeneous waste stream*	
Task 7 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 7.1:	Tripping hazards/working-walking surfaces—uneven, unstable or steep terrain, rocks and debris, piping, cables and lines on ground
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces
Hazard 7.2:	Lifting and back strain—waste container handling, bulked sample container/material handling and movement, setting up connection to receiving container
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 7.3:	Stored energy sources—pressurized lines during liquid transfers
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections) Section 2.2.8, Pressurized Systems
Hazard 7.4:	Chemical and Radiological Contaminants—sample and materials being returned, areas around consolidation tank, lines, and pumps
Mitigation:	(Level C/D+ PPE [Section 5] in conjunction with implementing hazards controls in the following section) Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Temporary Radiological Shielding (as required by RWP) Radiological Work Permit(s)
Hazard 7.5:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards

Table 2-2. (continued).

Hazard 7.6:	Noise—hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.3.1, Noise
ACTIVITY OR TASK: TASK 8 – CONFIRMATION/RCRA CLOSURE SAMPLING AND PHASE 3 EXCAVATION	
• Collect Samples from Bottom of Excavation Area and Tank Footprints • Excavate Soils Exceeding remedial action objectives (RAO) • Collect Additional Confirmation Samples as Required	
V-Tank Remediation Task 8 - Associated Hazards or Hazardous Agent and Mitigation	
Hazard 8.1:	Heavy equipment movement/vehicle traffic/material placement, staging excavated soils in SSA—struck-by and caught-between hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.5, Powered Equipment and Tools Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 8.2:	Excavation—heavy equipment operation, struck-by/caught-between, swing radius, staged spoil piles, sloped excavation, excavation near existing structures and building
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 8.3:	Tripping hazards/working-walking surfaces—sloped excavation, uneven, unstable or steep terrain, rocks and debris, piping, cables and lines on ground
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 7, Site Security and Control
Hazard 8.4:	Lifting and back strain—material handling and movement, sampling materials lifting/handling, SSA HDPE handling
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 8.5:	Combustible/flammable liquids—fueling of equipment on site, combustible materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.2.7, Fire Hazards and Material Hazards

Table 2-2. (continued).

Hazard 8.6:	Stored energy sources—buried utilities, energized cables in conduit on ground, overhead lines, raised equipment position, stacked/stored materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections) Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.13, Overhead Objects and Hazards
Hazard 8.7:	Chemical and Radiological Contaminants—contaminants in soils under tanks or at bottom of excavations
Mitigation:	(Level D+/C PPE [Section 5] in conjunction with implementing hazards controls in the following section) Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Radiological Work Permit(s)
Hazard 8.8:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard 8.9:	Noise—Heavy equipment operation, hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.3.1, Noise
ACTIVITY OR TASK: TASK 9 – SITE BACKFILLING	
• Backfill excavation • Compact excavation • Add clean soil layer (SSA only)	
V-Tank Remediation Task 9 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 9.1:	Heavy equipment movement/vehicle traffic/material placement/compaction — struck-by and caught-between hazards, pinch points, overhead obstructions, subsidence
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.5, Powered Equipment and Tools Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects and Hazards Section 2.2.16, Subsidence Section 7, Site Security and Control
Hazard 9.2:	Tripping hazards/working-walking surfaces—uneven, unstable or steep terrain, rocks and debris, piping, subsidence, cables and lines on ground
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces Section 2.2.16, Subsidence

Table 2-2. (continued).

Hazard 9.3:	Lifting and back strain—material handling and movement, compaction of area near building hand compactors
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 9.4:	Combustible/flammable liquids—fueling of equipment on site, combustible materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.2.7, Fire Hazards and Material Hazards
Hazard 9.5:	Stored energy sources—overhead lines, raised equipment position, stacked/stored materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections) Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects and Hazards
Hazard 9.6:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard 9.7:	Noise—Heavy equipment operation, hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.3.1, Noise
Hazard 9.8:	Dust—Placement of soil at SSA, heavy equipment movement, compaction
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.2.10, Heavy Equipment and Moving Machinery
ACTIVITY OR TASK: TASK 10: WASTE TREATMENT (AIR SPARGING)	
• Introduce air to the Consolidation Tanks • Sample treated waste • Sampling of S-GAC and GAC filter media	
Task 10 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 10.1:	Tripping hazards/working-walking surfaces—uneven, unstable or steep terrain, rocks and debris, piping, cables and lines on ground and near tanks
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces

Table 2-2. (continued).

Hazard 10.2:	Lifting and back strain—sample container handling, material handling and movement, setting up sampling equipment, handling Viking containers
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 10.3:	Stored energy sources—pressurized lines recirculation into consolidation tanks and at point (port) of sample collection, electrical conduit and panels in weather enclosure
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections) Section 2.2.8, Pressurized Systems
Hazard 10.4:	Chemical and Radiological Contaminants—consolidation tank content being sampled, consolidation tank, lines, and pumps
Mitigation:	(Level C/D+ PPE [Section 5] in conjunction with implementing hazards controls in the following section) Section 2.1, Chemical and Radiological Hazards and Mitigation Section 2.2.6, Electrical Hazards and Energized Systems Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Temporary Radiological Shielding (as required by RWP) Radiological Work Permit(s)
Hazard 10.5:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard 10.6:	Noise—hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.3.1, Noise

Table 2-2. (continued).

ACTIVITY OR TASK: TASK 11 – EXCAVATION AND SAMPLING ACTIVITIES AT NEW SITES	
• Excavation of contaminated soils at new site areas • Screening and sampling of excavated soils • Confirmation sampling following excavation	
V-Tank Remediation Task 11 – Associated Hazards or Hazardous Agent and Mitigation	
Hazard 11.1:	Heavy equipment movement/vehicle traffic/material placement, —struck-by and caught-between hazards, overhead equipment obstructions, hoisting and rigging (if soil bags are used)
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.5, Powered Equipment and Tools Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.12, Hoisting and Rigging of Equipment Section 2.2.13, Overhead Objects and Hazards Section 7, Site Security and Control
Hazard 11.2:	Excavation—heavy equipment operation, struck-by/caught-between, swing radius, staged spoil piles, sloped excavation, excavation in close proximity to piping systems/tanks, placement of roll-off containers, subsidence
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects and Hazards Section 2.2.16, Subsidence Section 7, Site Security and Control
Hazard 11.3:	Tripping hazards/working-walking surfaces/fall hazard—uneven, unstable or steep terrain; open excavation; subsidence; rocks and debris; piping, cables and lines on ground; piping; ice/frost
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.3, Working and Walking Surfaces Section 2.2.4, Elevated Work Areas Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.16, Subsidence
Hazard 11.4:	Pinch points, sharp surfaces, overhead hazards—Materials handling, usage of hand tools, walking around equipment, piping and tanks, haul truck operations
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Backstrain Section 2.2.3, Working and Walking Surfaces Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.13, Overhead Objects

Table 2-2. (continued).

Hazard 11.5:	Lifting and back strain—equipment material handling/movement/installation, soil cover, soil bag handling
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.2.1, Material Handling and Back Strain Section 2.2.2, Repetitive Motion and Musculoskeletal Disorders
Hazard 11.6:	Combustible/flammable liquids—fueling of equipment on site, combustible materials
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.2.7, Fire Hazards and Material Hazards
Hazard 11.7:	Stored energy sources—buried utilities, energized cables in conduit on ground, overhead lines, raised equipment position, stacked/stored materials, electrical cords
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following Sections) Section 2.2.6, Electrical Hazards and Energized Systems Section 2.2.10, Heavy Equipment and Moving Machinery Section 2.2.11, Excavation, Surface Penetrations, and Outages Section 2.2.12, Hoisting and Rigging of Equipment (if required to rig and hoist vacuum line/soil bags) Section 2.2.13, Overhead Objects and Hazards
Hazard 11.8:	Chemical and Radiological Contaminants—potentially encountered in soils around and surrounding piping
Mitigation:	(Level D+/C PPE [Section 5] in conjunction with implementing hazards controls in the following section) Section 2.1, Chemical and Radiological Hazards and Mitigation Section 3, Exposure Monitoring and Control Section 4.3, Radiological and Chemical Exposure Prevention Radiological Work Permit(s)
Hazard 11.9:	Outdoor hazards—Heat and cold stress, inclement weather, biological hazards
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following sections) Section 2.3.2, Temperature and Ultraviolet Light Hazards Section 2.3.3, Inclement Weather Conditions Section 2.3.4, Biological Hazards
Hazard: 11.10:	Noise—Heavy equipment/, hand tool usage, other tasks where noise levels exceed 84 dBA
Mitigation:	(Level D PPE [Section 5.0] in conjunction with implementing hazards controls in the following section) Section 2.3.1, Noise

2.1.1 Routes of Exposure

Chemical and radiological hazards will be eliminated, isolated, or mitigated to the extent possible during all project tasks. Where they cannot be eliminated or isolated, monitoring for chemical and radiological hazards will be conducted (as described in Section 3) to detect and quantify exposures. Additionally, administrative controls, training, technical procedures, and protective equipment will be used to further reduce the likelihood of exposure to these hazards.

Exposure pathways exist for nonradiological and radionuclides contaminants at the V-Tanks and new soil project sites. Controls listed above will be used to mitigate contact and uptake of these hazards; however, the potential for exposure to contaminants still exists. Exposure pathways include the following:

- **Inhalation.** Inhalation of particulates of WaterWorks™ crystals, or containing or contaminated with metal constituents or radionuclides and vapors from solvents contained in the tanks and potentially the surrounding soils during remedial action tasks. Small particles (<1.0 μm) may be inhaled and reach the alveolar portion of the lungs. Water-soluble metal may then be absorbed into the blood. Inhalation of particulate radionuclides can result in ionization of surrounding tissue.

- **Skin absorption and eye contact.** Direct contact with liquids, contaminated soils or surfaces could result in transfer to the skin. Solvents with a "skin" (see Table 2-1) could then be absorbed through unprotected skin or eyes. Skin contact with radionuclide-contaminated soil at the TAN V-Tank area could result in personal contamination with a potential for uptake.

- **Ingestion.** Ingestion of nonradiological contaminants and radionuclides is possible during project activities if proper controls and hygiene practices are not followed. Uptake of inorganic or radionuclides through the gastrointestinal tract could result in irritation of the gastrointestinal tract, irradiation of internal tissue, and/or deposition in target organs.

- **Injection.** Injection of contaminants is possible if the skin is broken or an existing wound is unprotected during handling of contaminated materials or debris. Injection of contaminants can result in localized irritation, radiological contamination (radionuclides), uptake of soluble contaminants, and deposition of insoluble contaminants.

The Job Safety Analyses (JSAs), Industrial Hygiene Exposure Assessments (EAs), RCT surveys, and radiological work permits (RWPs) will be used in conjunction with this HASP to address specific hazardous operations and radiological conditions at the TSF-09/-18 sites. Where required, these work permits will further detail specialized PPE and radiological dosimetry requirements.

2.2 Safety and Physical Hazards and Mitigation

Industrial safety and physical hazards will be encountered while performing V-Tanks and new sites remedial operations. Section 4.2 provides general safe-work practices that must be followed at all times. The following sections describe specific industrial safety hazards and procedures to be followed to eliminate or minimize potential hazards to project personnel.

2.2.1 Material Handling and Back Strain

Material handling, lifting and maneuvering of various pieces of equipment, poor posture during twisting of the body or ascending/descending heavy equipment could all result in employee injury. All lifting and material-handling tasks will be performed in accordance with Management Control Procedure (MCP)-2692, "Preventing Ergonomic and Back Disorders." Personnel will not physically lift objects weighing more than 22 kg (50 lb) or 33 percent of their body weight (whichever is less) alone and will use the following manual lifting technique:

- Consider the size, weight, and shape of the object to be carried. Evenly distribute the load, if possible.

- Set feet solidly. One foot can be slightly ahead of the other for increased stability and leverage. Feet should be far enough apart to give good balance and stability (approximately the width of the shoulders).
- Get as close to the load as possible. Bend legs about 90 degrees at the knees. Crouch, do not squat. It takes twice as much effort to get up from a squat.
- Keep the back as straight as possible. It may be far from being vertical, but it should not be arched.
- Grip the object firmly. Maintain that grip while lifting and carrying. Before changing or adjusting this grip, set the object down again.
- Straighten the legs to lift the object, and at the same time bring the back to a vertical position.
- Never carry a load that you cannot see over or around. Make sure the path of travel is clear.
- Carry the object close to the body
- Never turn at the waist to change direction or to put the object down. Turn the whole body and crouch down to lower the object.
- Use the special lifting tools fabricated for lifting grates and manhole covers for these activities. Be particularly careful when replacing a cover to keep fingers away from edges.

Additionally, back strain and ergonomic considerations must be given to material handling and equipment usage. Mechanical and hydraulic lifting devices should be used to move materials whenever possible. The industrial hygienist (IH) will conduct ergonomic evaluations of various project tasks to determine the potential ergonomic hazards and provide recommendations to mitigate these hazards. Applicable requirements from PRD-324, "Material Handling, and Storage," also will also be followed.

2.2.2 Repetitive Motion and Musculoskeletal Disorders

Some tasks to be conducted may expose personnel to repetitive-motion hazards, undue physical stress, overexertion, awkward postures, or other ergonomic risk factors that may lead to musculoskeletal disorders. Musculoskeletal disorders can cause a number of conditions including pain, numbness, tingling, stiff joints, difficulty moving, muscle loss, and sometimes paralysis. The assigned project industrial hygienist will evaluate project tasks and provide recommendations to reduce the potential for musculoskeletal disorders in accordance with MCP-2692, "Preventing Ergonomic and Back Disorders."

2.2.3 Working and Walking Surfaces

Uneven or unstable surfaces, sloped excavation faces, rocks, debris, installed and removed piping along with other material on the ground surface will create potential tripping hazards. Also, slippery work surfaces such as moisture or frost on the HDPE SSA cover or other surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls. Debris and tripping hazards will be removed or moved to the extent possible during the project to eliminate these hazards. All tools and equipment used during each shift will be placed back in the designated storage location unless required to be left in place. Cords and lines will be routed around walkways, stairs, and entrances and exits to eliminate tripping hazards. Elevated walkways and platforms will be kept clear of potential tripping hazards at all times. Personnel will use established roads and walkways to access specific areas of the site and not walk on designated traffic lanes. During the prejob briefing, all personnel will be made aware of tripping hazards that cannot be eliminated. All project personnel will wear required protective footwear with adequate traction sole to further mitigate slip and fall potential. Tripping and slip hazards will be evaluated during

the course of the project in accordance with PRD-2005 or PRD-5103, "Walking and Working Surfaces" and PRD-2002 or PRD-5096, "Fall Protection." Fall Hazard Prevention Analyses (FHPA), in accordance with PRD-5096, will be developed and followed for specific work activities.

2.2.4 Elevated Work Areas

Personnel will during the course of the project be required to work on elevated equipment or at heights above 1.8 m (6 ft). This work will require a fall protection hazard analyses (FHPA) to be prepared and utilized in accordance with PRD-5096, "Fall Protection," prior to beginning of work. Additionally, the following MCP and PRDs will be followed as they relate to project operations associated with elevated work: PRD-2006 or PRD-5107, "Aerial Lifts and Elevating Work Platforms," PRD-2003 or PRD-5067, "Ladders," PRD-2004 or PRD-5098, "Scaffolding," PRD-2005, or PRD-5103, "Walking and Working Surfaces," PRD-2014 or PRD-22, "Excavations and Surface Penetrations."

2.2.5 Powered Equipment and Tools

Powered equipment and tools will be used and present potential physical hazards (e.g., pinch points, electrical hazards, flying debris, struck-by, and caught-between) to personnel operating them. All portable equipment and tools will be properly maintained and used by qualified individuals and in accordance with the manufacturer's specifications. At no time will safety guards be removed or modified. Requirements from PRD-2015 or PRD-5101, "Portable Equipment and Handheld Power Tools," will be followed for all work performed with powered equipment including hand tools. All tools will be inspected by the user prior to use to ensure they are in good working condition, guards are in place, and cords are in good condition. Any tool found to be damaged will be tagged and taken out of service. Electric power operated tools shall either be of the approved double-insulated type or grounded or battery operated power supplied electric tools used outdoors will have a ground-fault circuit interrupter (GFCI) protection inline. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.

2.2.6 Electrical Hazards and Energized Systems

Electrical equipment and tools, as well as overhead and underground lines associated with remedial actions may pose shock or electrocution hazards to personnel. Safety-related work practices will be employed to prevent electric shock or other injuries resulting from direct or indirect electrical contact. Ground-fault protected electrical circuits and receptacles in combination with safety-related work practices will be employed to prevent electric shock or other injuries resulting from direct or indirect electrical contact. All electrical work will be reviewed and completed under the appropriate work controls (e.g., technical procedures [TPRs] or work orders). Before conducting electrical work, hazardous energy of the affected system will be brought to a zero energy state through the use of isolation methods in accordance with the following:

- MCP-3650, "Chapter IX Level I Lockouts and Tagouts"
- MCP-3651, "Chapter IX Level II Lockouts and Tagouts"
- Applicable facility supplemental procedures for the system or component being worked.

NOTE: *All forms of hazardous energy shall be subject to the appropriate level of lockout and tagout to ensure employee safety and health. In addition to electrical -the following hazardous energy sources (but not limited to) shall be controlled: hydraulic, pneumatic, mechanical motion, etc.*

If work on energized systems is necessary, these practices will conform to the requirements in PRD-2011 or PRD-5099, "Electrical Safety," and Parts I through III of the NFPA 70E, "Standard for Electrical Safety in the Workplace." Additionally, all electrical and other utilities will be identified before conducting surface penetration maintenance activities in accordance with RPD-2014 or PRD-22, "Excavation and Surface Penetrations."

Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated near power lines in accordance with the following minimum requirements:

- For lines rated 50 kV, or below, minimum clearance between the lines and any part of the crane or load shall be 10 ft.
- For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 ft plus 0.4 in. for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than 10 ft.
- In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 ft for voltages less than 50 kV, and 10 ft for voltages over 50 kV, up to and including 345 kV, and 16 ft for voltages up to and including 750 kV.
- A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.

All overhead wires shall be considered to be energized line(s) unless and until the person owning the line(s) or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded in accordance with 29 CFR 1926.550, "Cranes and Derricks."

If required clearance can not be met and work must be performed within the clearance area, then the line must be de-energized through a utility outage coordinated with the utility owner.

The heat sealer for the soil bags poses a potential electrical and burn hazard. To mitigate this hazard, follow all manufacturers' instructions for use:

- Do not touch when hot
- Use appropriate PPE
- Do not lay heat sealer down on combustible materials (e.g., weeds, brush, paper, etc.)
- Use GFCI.

2.2.7 Fire and Flammable Materials Hazards

Fuel will be required for some equipment use during project remedial. Flammable hazards may include transfer and storage of flammable or combustible liquids. Portable fire extinguishers will be strategically located at the project site to combat Class ABC fires. They will be located in all active areas, on or near all facility equipment that have exhaust heat sources. Guidance from MCP-2707, "Compatible Chemical Storage," will be consulted when storing chemicals.

2.2.7.1 Combustible Materials. Combustible or ignitable materials in contact with or near exhaust manifolds, catalytic converters, or other ignition sources could result in a fire. The accumulation of combustible materials will be strictly controlled. Disposal of combustible materials shall be assessed at the end of each day. Class A combustibles such as trash, cardboard, rags, wood, and plastic will be properly disposed of in appropriate waste containers and removed from the site on a routine basis. All solvent waste, oily rags, and flammable liquids shall be kept in fire resistant covered containers until removed from project site. A fire protection engineer should be contacted if questions arise about potential ignition sources. The fire protection engineer may also conduct periodic site inspections to ensure all fire protection requirements are being met.

2.2.7.2 Flammable and Combustible Liquids. Fuel used at the site for fueling must be safely stored, handled, and used. Only Factory Mutual (FM)/Underwriters Laboratories, Inc. (UL) -approved flammable liquid containers, labeled with the content, will be used to store fuel. It is anticipated that only vehicle mounted tanks or fuel trucks will be used to fuel heavy equipment. If portable fuel containers are used, they will be stored at least 15 m (50 ft) from any facilities and ignition sources or stored inside an approved flammable storage cabinet. Portable motorized equipment (generators, light plants, etc.) will be shut off and allowed to cool down in accordance with the manufacturer's operating instructions prior to refueling to minimize the potential for a fuel fire. Heavy equipment will be fueled at the designated storage location or work area that has been cleared of combustible materials. Additional 29 CFR 1926.152, "Flammable and Combustible Liquids" requirements include but are not limited to the following:

- The tank trucks shall comply with the requirements covered in the "Standard for Tank Vehicles for Flammable and Combustible Liquids" (NFPA 385).
- Only flammable liquid containers approved by the Factory Mutual and Underwriters Laboratories, and labeled with the contents, will be used to store fuel.
- All fuel containers will be stored at least 15 m (50 ft) from any facilities and ignition sources, or they will be stored inside an approved flammable storage cabinet.
- Flammable liquids may be used only where there are no open flames or other sources of ignition within 50 ft of the operation, unless conditions warrant greater clearance.
- Conspicuous and legible signs prohibiting smoking shall be posted.
- The motors of all equipment being fueled shall be shut off during the fueling operation.
- Each service or fueling area shall be provided with at least one BC fire extinguisher. They shall be located so that an extinguisher will be within 75 ft of each dispenser and lubrication or service area.
- Transfer of flammable liquids from one container to another shall be done only when containers are electrically interconnected (bonded).

Additional requirements are provided in PRD-2201 "Flammable and Combustible Liquid Storage" and PRD-308, "Handling and Use of Flammable and Combustible Liquids." Portable motorized equipment (e.g., generators and light plants) will be shut off and allowed to cool down in accordance with the manufacturer's operating instructions before being refueled to minimize the potential for a fuel fire.

2.2.7.3 Welding, Cutting, or Grinding. Personnel conducting welding, cutting, or grinding tasks may be exposed to molten metal, slag, and flying debris. Additionally, a fire potential exists if combustible materials are not cleared from the work area. Requirements from PRD-2010 or PRD-5110, "Welding, Cutting, and Other Hot Work," will be followed whenever these types of activities are conducted.

2.2.8 Pressurized Systems

The hazards presented to personnel, equipment, facilities, or the environment because of inadequately designed or improperly operated pressure (or vacuum) systems include blast effects, shrapnel, fluid jets, release of toxic or asphyxiant materials, contamination, equipment damage, personnel injury, and death. These systems can include pneumatic, hydraulic, vacuum, or compressed gas systems. The requirements of PRD-2009, "Compressed Gases," PRD-5040, "Handling and Use of Compressed Gases, PRD-5, "Boilers and Unfired Pressure Vessels," and the manufacturer's operating and maintenance instructions must be followed. This includes inspection, maintenance, and testing of systems and components in conformance with American National Standards Institute (ANSI) requirements.

All systems and components which meet the minimum action criteria of PRD-320, "Pressure System Safety," shall be subject to the requirements set forth in this document. Additionally, all connections or fittings meeting the specifications of high pressure vapor gas or liquid lines shall be protected by whip restraints at all locations where flexible lines are incorporated into the system. Exception: whip restraints are not required at flexible line connections/fittings when both of the respective termination points are equipped with a positive acting /self-closing mechanism. All pressure systems will be operated in the designed operating pressure range, which is typically 10 to 20% less than the maximum allowable working pressure. Additionally, all hoses, fittings, lines, gauges, and system components will be rated for the system for at least the maximum allowable working pressure (generally the relief set point). The project safety professional should be consulted about any questions of pressure systems in use at the project site.

If a soil vacuum system such as the Utilivac (or equivalent) is utilized for soil removal in and around the tanks and piping, then this system will be operated in accordance with the manufacturer's operating instructions. Required guards and screens to prevent clothing or other objects from entering the intake will be in place at all times during operation.

2.2.9 Compressed Gases

If compressed gas cylinders are used for cutting operations or in support of radiological monitors (such as P_{10} gas), all cylinders will be used, stored, handled, and labeled in accordance with PRD-2009, "Compressed Gases" and PRD-5040 "Handling and Use of Compressed Gasses." Additionally, the project safety professional should be consulted about any compressed gas cylinder storage, transport, and usage issues including compatibility of gases.

2.2.10 Heavy Equipment and Moving Machinery

Hazards associated with the operation of heavy equipment include injury to personnel (such as struck-by and caught-between hazards) and equipment and property damage. All heavy equipment will be operated in the manner in which it was intended and in accordance with manufacturer's instructions. Only authorized qualified personnel will be allowed to operate equipment, and personnel near operating equipment must stay within the visual line of sight of the operator. Personnel also must comply with the applicable requirements of the following:

- PRD-2020 and MCP-2745, “Heavy Industrial Vehicles”
- PRD-2019 and PRD-5123, “Motor Vehicle Safety”
- DOE-STD-1090-2004, Chapter 10, “Forklift Trucks.”

All personnel in the controlled areas where equipment is operating and within the designated traffic lanes for transport of materials to the SSA will wear high visibility reflective vests. Additional safe practices will include the following:

- All heavy equipment will have backup alarms.
- All heavy equipment, including roll-off containers, shall be placed on stable soil and appropriately leveled. Use spotter as appropriate.
- Walking directly behind or to the side of heavy equipment without the operator’s knowledge is prohibited. All precautions will be taken before moving heavy equipment. Use spotters as necessary.
- While operating heavy equipment in the work area, the equipment operator will maintain communication with a designated person who will be responsible for providing direct voice contact or approved standard hand signals. In addition, all facility personnel in the immediate work area will be made aware of the equipment operations.
- All stored or staged equipment will be kept out of traffic lanes and access ways and will be stored so as not to endanger personnel at any time (such as placing buckets or end effectors on the ground and bleeding valves from the controls to ensure zero hydraulic energy state).
- All unattended equipment will have appropriate reflectors or be barricaded if left on or adjacent to roadways.
- All parked equipment will have the parking brake set and chocks will be used when equipment is parked on inclines. All parked forklifts will have the forklift tines in the lowered position (resting on ground or floor).
- The swing radius of heavy equipment will be adequately barricaded or marked to prevent personnel from entering into the swing radius.

2.2.11 Excavation, Surface Penetrations, and Outages

With the exception of certain soil sampling, all surface penetrations and related outages will be coordinated through the TAN utilities and will require submittal of an outage request (i.e., Form 433.1, “Outage Request”) for outages (e.g., road, electrical, and water). The submission of an outage request will not be considered an approval to start the work. Other specific outage requirements are addressed in the special conditions section of the management and operating contract. No surface penetrations will be allowed or conducted until the area has been evaluated and an approved subsurface evaluation documented.

All excavation activities will be conducted and monitored in accordance with PRD-2014 or PRD-22, “Excavation and Surface Penetrations,” and 29 CFR 1926, Subpart P, “Excavations.” The following are some key elements from these requirements:

- Structural ramps that are used solely by employees as a means of access or egress from excavations will be designed by a competent person. Structural ramps used for access or egress of equipment will be designed by a competent person qualified in structural design and will be constructed in accordance with the design. Structural ramps will be inspected in accordance with Form 440.31."

- Employees exposed to heavy equipment and other vehicular traffic will be provided with and will wear warning vests or other suitable garments marked with or made of reflecting or high-visibility material.

- A barricade, hand or mechanical signals, or stop logs (or equivalent) warning system shall be established for mobile equipment operated adjacent to the excavation, or when such equipment is required to approach the edge of the excavation, and the operator does not have a clear and direct view of the edge of the excavation. If possible, the grade should be away from the excavation.

- No personnel shall be permitted underneath loads handled by lifting or digging equipment. Personnel shall stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded to provide adequate protection for the operator.

- Daily inspections of active excavations, areas adjacent to the excavations, and protective systems will be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection will be conducted by the competent person before the start of work and as needed throughout the shift. Inspections also will be made after every rainstorm or other hazard-increasing occurrence. Inspection activities shall be documented on Form 440.31. Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

- Sloping will be maintained in accordance with the requirements set forth in PRD-2014 or PRD-22 for Class "C" soil.

- Sidewalks, pavements and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures. A registered professional engineer (RPE) will review planned excavation activities in the V-Tanks area and provide a written determination as to whether existing structures are sufficiently removed from the excavation so as to be unaffected by the excavation activity. Where such excavation activities result in removal of materials below the level of the base or footing of any foundation or retaining wall, this RPE determination shall also state whether such activities are reasonably expected to pose a hazard to employees.

- Atmospheric testing of the excavation will be conducted as deemed appropriate by the excavation competent person or Industrial Hygiene to ensure that a hazardous atmosphere does not exist prior to any personnel entering the excavation. Work situations which may also create a hazardous atmosphere during the course of work shall also be evaluated. This sampling shall include the following- in this order: Oxygen (19.5-23.5%), LEL< (10%), and toxic materials (subject to % of PEL, etc. as identified by IH).

2.2.12 Hoisting and Rigging of Equipment

All hoisting and rigging will be performed in accordance with PRD-2007, PRD-600, "Hoisting and Rigging," and DOE-STD-1090-04, "Hoisting and Rigging." Hoisting and rigging equipment will show evidence of a current inspection (e.g. tag) and be inspected by qualified personnel before use. Additionally, the operator or designated person for mobile cranes or boom trucks will perform a visual inspection each day or before use (if the crane has not been in regular service) of items such as, but not limited to, the following:

- All control mechanisms for maladjustment that would interfere with proper operation
- Crane hooks and latches for deformation, cracks, and wear
- Hydraulic systems for proper oil level
- Lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leakage
- Hoist ropes for kinking, crushing, birdcaging, and corrosion
- All anti-two-block, two-block warning, and two-block damage prevention systems for proper operation.

2.2.13 Overhead Objects

Personnel may be exposed to falling overhead objects or debris, impact hazards from equipment or piping during the course of the project. Sources for these hazards will be identified and mitigated in accordance with PRD-2005 or PRD-5103, "Walking and Working Surfaces." Overhead impact hazards will be eliminated where feasible or marked with high visibility tape or equivalent. Protective systems will be used where there is a potential for falling debris, low overhead clearances, or contact with hoisting and rigging equipment, in combination with head protection, such as a hard hat.

2.2.14 Personal Protective Equipment

Wearing PPE will reduce a worker's ability to move freely, see clearly, and hear directions and noise that might indicate a hazard. In addition, PPE can increase the risk of heat stress. Work activities at the task site will be modified as necessary to ensure that personnel are able to work safely in the required PPE. Work-site personnel will comply with PRD-2001 or PRD-5121, "Personal Protective Equipment," and MCP-432, "Radiological Personal Protective Equipment." All personnel who wear PPE will be trained in its use and limitations in accordance with PRD-2001 or PRD-5121. Where heat stress conditions exist, stay time may be mandated. When required, stay time will be documented on a safe work permit (SWP) or other work control document.

2.2.15 Decontamination

Decontamination procedures for personnel and equipment are detailed in Section 11. Potential hazards to personnel conducting decontamination tasks include back strain; slip, trip, and fall hazards; and cross-contamination from contaminated surfaces. Additionally, electrical hazards may be present if powered equipment (e.g. a powered pressure washer) is used. Mitigation of these walking-working surfaces and electrical hazards are addressed in other prior subsections. If a power washer or heated power washer is used, units will be operated in accordance with manufacturer's operating instructions, personnel will wear appropriate PPE to prevent high-pressure spray injuries, and ground-fault circuit protection will be used. These tasks will only be conducted in approved areas. Personnel will wear required PPE at all times during decontamination tasks as listed in Section 5.

2.2.16 Subsidence

Personnel might be exposed to subsidence hazards during project activities when operating equipment over areas with unconsolidated or uncompacted areas. This is primarily an equipment hazard, however, personnel also may be at risk from walking in these areas. Where required, personnel will not enter potential subsidence areas until they obtain clearance from supervision –only after they have received direction from an excavation competent person. Soil stability conditions may need to be evaluated in excavations prior to employee entry. This evaluation shall be conducted by an excavation competent person when action levels are met during the work process or as atmospheric conditions necessitate. Barriers and postings for potential subsidence areas will be observed at all times.

2.3 Environmental Hazards and Mitigation

Potential environmental hazards will be encountered during V-Tanks and other new site remedial actions. These hazards will be identified and mitigated to the extent possible. This section describes these environmental hazards and states what procedures and work practices will be followed to mitigate them.

2.3.1 Noise

Hazardous noise sources (sources exceeding 84 decibel A-weighted [dBA]) at the project site may include heavy equipment, industrial vehicles, hand tools, compressors, generators, and alarms. The effects of high sound levels (noise) may include the following:

- Personnel being startled, distracted, or fatigued
- Physical damage to the ear and pain and temporary or permanent hearing loss
- Interference with communication that would warn of danger.

Where noise levels are suspected of exceeding 80 dBA, noise measurements will be performed in accordance with MCP-2719, “Controlling and Monitoring Exposures to Noise,” to determine if personnel are routinely exposed to noise levels in excess of the applicable time-weighted average (TWA) (85 dBA for 8 hr of exposure or 83 dBA for 10-hr exposures).

Personnel whose noise exposure routinely meet or exceed the allowable TWA will be enrolled in the INL Occupational Medical Program (OMP), or subcontractor hearing conservation program as applicable. Personnel working on jobs that have noise exposures greater than 85 dBA (83 dBA for a 10-hr TWA) will be required to wear hearing protection until noise levels have been evaluated and will continue to wear the hearing protection specified by the industrial hygienist until directed otherwise. Hearing protection devices will be selected and worn in accordance with MCP-2719, “Controlling and Monitoring Exposures to Noise.”

2.3.2 Temperature and Ultraviolet Light Hazards

Project tasks will be conducted during times when there is a potential for heat or cold stress and ultraviolet light hazards that could present a potential hazard to personnel. The industrial hygienist and HSO will be responsible for obtaining meteorological information to determine if additional heat or cold stress administrative controls are required. All project personnel must understand the hazards associated with heat/cold stress and ultraviolet light hazards, and take preventive measures to minimize the effects. MCP-2704 “Heat and Cold Stress” guidelines will be followed when determining work-rest schedules or when to halt work activities because of temperature extremes.

2.3.2.1 Heat Stress. High ambient air temperatures can result in increased body temperature, heat fatigue, heat exhaustion, or heat stroke that can lead to symptoms ranging from physical discomfort, to unconsciousness, to death. In addition, tasks requiring the use of protective equipment or respiratory protection prevent the body from cooling. Personnel must inform the field team leader (FTL) or HSO when experiencing any signs or symptoms of heat stress or when observing a fellow employee (i.e., buddy) experiencing them. Heat stress stay times will be documented on the appropriate work control document(s) (i.e., an SWP, Pre-Job Briefing Form, or other) by the HSO in conjunction with the IH (as required) when personnel wear PPE that may increase heat body burden. These stay times will take into account the amount of time spent on a task, the nature of the work (i.e., light, moderate, or heavy), type of PPE worn, and ambient work temperatures. Table 2-3 lists heat stress signs and symptoms of exposure.

Table 2-3. Heat stress signs and symptoms of exposure.

Heat-Related Illness	Signs and Symptoms	Emergency Care
Heat rash	Red skin rash and reduced sweating.	Keep the skin clean. Change all clothing daily. Cover affected areas with powder containing cornstarch or with plain cornstarch.
Heat cramps	Severe muscle cramps and exhaustion, sometimes with dizziness or periods of faintness.	Move the patient to a nearby cool place. Give the patient half-strength electrolytic fluids. If cramps persist, or if signs that are more serious develop, seek medical attention.
Heat exhaustion	Rapid, shallow breathing; weak pulse; cold, clammy skin; heavy perspiration; total body weakness; dizziness that sometimes leads to unconsciousness.	Move the patient to a nearby cool place. Keep the patient at rest. Give the patient half-strength electrolytic fluids. Treat for shock. Seek medical attention. DO NOT TRY TO ADMINISTER FLUIDS TO AN UNCONSCIOUS PATIENT.
Heat stroke	Deep, then shallow, breathing; rapid, strong pulse, then rapid, weak pulse; dry, hot skin; dilated pupils; loss of consciousness (possible coma); seizures or muscular twitching.	Cool the patient rapidly. Treat for shock. If cold packs or ice bags are available, wrap them and place one bag or pack under each armpit, behind each knee, one in the groin, one on each wrist and ankle, and one on each side of the neck. Seek medical attention as rapidly as possible. Monitor the patient's vital signs constantly. DO NOT ADMINISTER FLUIDS OF ANY KIND.

NOTE: *Heat exhaustion and heat stroke are extremely serious conditions that can result in death and should be treated as such. The field team leader (FTL), or designee, should immediately request an ambulance to be dispatched from the Test Area North (TAN) (777 or 526-6263), or Central Facilities Area (CFA) -1612 medical facility (777 or 526-1515), and the individual cooled as described above in Table 2-3 based on the nature of the heat stress illness*

Low Temperatures and Cold Stress. Personnel will be exposed to low temperatures during fall and winter months or at other times of the year if relatively cool ambient temperatures combined with wet or windy conditions exist. MCP-2704 "Heat and Cold Stress" guidelines will be followed when determining warm-up schedules (if needed).

Additional cold weather hazards may exist from working on snow- or ice-covered surfaces. Slip, fall, and material-handling hazards are increased under these conditions. Every effort must be made to ensure walking surfaces are kept clear of ice. The FTL or HSO should be notified immediately if slip or fall hazards are identified at the project locations.

2.3.2.2 Ultraviolet Light Exposure. Personnel may be exposed to ultraviolet light (UV) (i.e., sunlight) when conducting project tasks. Sunlight is the main source of UV known to damage the skin and to cause skin cancer. The amount of UV exposure depends on the strength of the light, the length of exposure, and whether the skin is protected. No UV rays or suntans are safe. The following are mitigative actions that may be taken to minimize UV exposure:

- Wear clothing to cover the skin (long pants [no shorts] and long sleeve or short sleeve shirt [no tank tops])
- Use a sunscreen with a sun protection factor of at least 15
- Wear a hat (hard hat where required)
- Wear UV-absorbing safety glasses
- Limit exposure during peak intensity hours of 10 a.m. to 4 p.m. whenever possible.

2.3.3 Inclement Weather Conditions

When inclement or adverse weather conditions develop that may pose a threat to persons or property at the project site (e.g., sustained strong winds 25 mph or greater, electrical storms, heavy precipitation, or extreme heat or cold), conditions will be evaluated and a decision made by the HSO with input from other personnel to suspend work, employ compensatory measures, or proceed. The FTL and HSO will comply with INL MCPs and facility work control documents that specify limits for inclement weather.

2.3.4 Biological Hazards

The INL is located in an area that provides habitat for various rodents, insects, and vectors (i.e., organisms that carry disease-causing microorganisms from one host to another). The potential exists for encountering nesting materials or other biological hazards and vectors. The hantavirus may be present in the nesting and fecal matter of deer mice. If such materials are disturbed, they can become airborne and create a potential inhalation pathway for the virus. Contact and improper removal of these materials may provide additional inhalation exposure risks.

If suspected rodent nesting or excrement material is encountered, the industrial hygienist will be notified immediately and no attempt will be made to remove or clean the area. Following an evaluation of the area, disinfection and removal of such material will be conducted in accordance with MCP-2750, "Preventing Hantavirus Infection."

Snakes, insects, and arachnids (e.g., spiders, ticks, and mosquitoes) also may be encountered. Common areas to avoid include material stacking and staging areas, under existing structures (e.g., trailers and buildings), under boxes, and other areas that provide shelter. Protective clothing will generally prevent insects from direct contact with the skin. If potentially dangerous snakes or spiders are found or are suspected of being present, warn others, keep clear, and contact the industrial hygienist or HSO for additional guidance as required.

Insect repellant (DEET or equivalent) may be required. Areas where standing water has accumulated (e.g., evaporation ponds) provide breeding grounds for mosquitoes and should be avoided. In cases where a large area of standing water is encountered, it may be necessary to pump the water out of the declivity (areas other than the evaporation ponds).

2.3.5 Confined Spaces

The V-Tanks, TSF-21 or other new site excavation areas have the potential to create a space with a hazardous atmosphere. The excavation competent person is responsible for evaluating each excavation as described in Section 2.2.11. However, these excavations are not considered a confined space. The industrial hygienist will be responsible for identifying any potential confined spaces (not already identified and posted by TAN operations) and for conducting an evaluation to determine if the confined space will be a permit-required space. If entry into any confined space is required, then all requirements of MCP-2749, "Confined Spaces," will be followed.

2.4 Other Task-Site Hazards

Task-site personnel should alert for potential hazards and immediately inform the FTL or HSO of new or changing hazardous conditions so that action can be taken to eliminate or control these hazards. All personnel have the authority to initiate STOP WORK actions in accordance with MCP-553, "Stop Work Authority," if it is perceived that an imminent safety or health hazard exists or other condition such as a line or pump failure that could result in an environmental release. Project personnel can take corrective actions within the scope of the approved work control documents to correct minor safety of health hazards and then inform the FTL and HSO. Personnel will only take corrective actions within the level of their training.

Personnel working at the task site are responsible to use safe-work practices, report unsafe working conditions or acts, and exercise good housekeeping habits with respect to tools, equipment, and waste throughout the course of the project.

2.5 Site Inspections

Project personnel may participate in site inspections during the work control preparation stage (such as the hazard identification and verification walk-downs), conduct self-assessments or other inspections. Additionally, periodic safety inspections will be performed by the HSO, project manager, or FTL in accordance with MCP-3449, "Safety and Health Inspections."

Targeted or required self-assessments may be performed during the performance of project activities in accordance with MCP-8, "Self-Assessment Process for Continuous Improvement." All inspections and assessments will be documented and available for review by the FTL. These inspections will be noted in the FLT logbook. Health and safety professionals present at the task site may, at any time, recommend changes in work habits to the FTL. Surveillances made by health and safety personnel shall be documented on Form 220.03 or other similar form and communicated to the FTL, ESH Manager, and other responsible management. However, all changes that may affect the work control documents must have concurrence from the appropriate project technical representatives and a document action request (DAR) prepared when required.

3. EXPOSURE MONITORING AND SAMPLING

A potential for exposure to radiological, chemical, or physical hazards exists during project tasks. Refinement of work control zones (see Section 7), use of engineering and administrative controls, worker training, procedural compliance, and wearing PPE provides the mitigation strategy for these hazards. Monitoring and sampling will be used during project tasks to (1) assess the effectiveness of engineering and administrative controls, (2) select and evaluate the type of PPE needed for individual tasks, and (3) determine the need for upgrading and downgrading of PPE as described in Section 5. Baseline monitoring will be conducted in and around the active V-Tank project work locations during initial tasks and periodically thereafter to evaluate site-specific conditions and as deemed appropriate by Radiological Control (RadCon) and health and safety professionals. Industrial hygiene exposure monitoring strategies will be defined on an Industrial Hygiene Exposure Assessment document contained electronically within the INL Hazard Assessment and Sampling System (HASS).

Tables provided in this section present the strategy for conducting exposure monitoring and sampling. These include:

- Table 3-1: Tasks and hazards to be monitored and monitoring instrument category
- Table 3-2: Monitoring instrument category and description
- Table 3-3: Action levels and associated responses for specific hazards.

3.1 Exposure and Action Levels

Exposure limits identified in Table 3-3 serve as the initial action levels for specific project hazards. Project tasks will be periodically assessed in accordance with PRD-25, "Activity Level Hazard Identification, Analysis, and Control," and evaluated by RadCon engineers and Industrial Hygiene personnel to ensure engineering control effectiveness. Action levels may be adjusted based on changing site conditions, exposure mitigation practices, and PPE levels. Changes to action levels other than specified in Table 3-3 shall be documented in the FTL logbook at the time of change and the change shall be discussed with all exposed personnel prior to work continuance.In any case, all potential radiological exposures will be kept as low as reasonably achievable (ALARA).

3.2 Environmental and Personnel Monitoring

Industrial Hygiene and RadCon personnel will conduct initial and periodic monitoring. The radiological control technician (RCT) and industrial hygienist (IH) will be responsible for determining the best monitoring technique for radiological and nonradiological contaminants (respectively). Safety hazards and other physical hazards will be monitored using instruments listed on Table 3-2 and mitigated as outlined in Section 2.

3.2.1 Industrial Hygiene Area and Personal Monitoring and Instrument Calibration

The project industrial hygienist will conduct full- and partial-period sampling of airborne contaminants and monitoring of physical agents at a frequency deemed appropriate based on direct-reading instrument readings and changing site conditions. All air sampling will be conducted using applicable National Institute of Occupational Safety and Health (NIOSH), OSHA, or other validated methods. Both personal and area sampling and monitoring may be performed.

Table 3-1. Tasks and hazards to be monitored.

Tasks	Hazard(s) to be Monitored[a]	Instrument Category to be Used[b]
V-Tank Remediation Task 1 - Mobilization and Site Preparation		
• Mobilize equipment and materials to the site • Setup and establish controlled zones and soil storage area (SSA) • Mobilize heavy equipment • Conduct system operability (SO) testing.	Ionizing radiation—(alpha, beta, gamma)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical and nonradiological constituents, hazardous atmospheres	3, 4
	Respirable dust—silica and other particulates of concern	3, 5
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8
V-Tank Remediation Task 2 - Soil Excavation, Equipment Installation, and Placement of Soil in SSA		
• Excavate Phase 1 soils to the soil storage area (SSA) • Install equipment at the TSF-18/-09 sites and make all connections of consolidation tanks and systems • Transfer Phase 1 excavated soils to the SSA.	Ionizing radiation—(alpha, beta, gamma)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical and nonradiological constituents, hazardous atmospheres	3, 4
	Respirable dusts and other particulates of concern	3,4,5
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8
V-Tank Remediation Task 3 - Waste Removal and Transfer		
• Supernatant Removal • Sludge Removal • Flushing • Tank Rinsing • Inspection	Ionizing radiation—(alpha, beta, gamma, fissile material)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical constituents—organic vapors, hazardous atmospheres	3,4,9
	Aerosols—Organic vapors, mists	2,3,4
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8

Table 3-1. (continued).

Tasks	Hazard(s) to be Monitored[a]	Instrument Category to be Used[b]
V-Tank Remediation Task 4 - Phase 2 Soil Excavation		
• Utilize Vacuum Extractor to Remove Soil • Haul and Place Removed Soil in SSA	Ionizing radiation—(alpha, beta, gamma)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical and nonradiological constituents, hazardous atmospheres	3,4
	Respirable dusts and other particulates of concern	3,4,5
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8
Activity or Task: 5 – Solidification Process Hardware Installation and Treatment		
• Introduce WaterWorks Crystals™ and installation of HEPA filtration system into emptied V-Tanks V-1, -2, and -3 • Install solidification process hardware • Transfer and solidify waste in V-Tank containers	Ionizing radiation—(alpha, beta, gamma, fissile material)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical constituents—organic vapors, hazardous atmospheres	3,4,9
	Aerosols and Particulates—Organic vapors, mists, particulates	2,3,4
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8
V-Tank Remediation Task 6 - Tank and Piping Removal, Outer Tank Surface Decontamination		
• Attach Rigging or Lifting Points to Tanks • Hoist Tanks and Place in Designated Area • Decontaminate Outer Tank Surface • Cap and Remove Existing Lines	Ionizing radiation—(alpha, beta, gamma, fissile material)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical constituents—organic vapors, hazardous atmospheres	3,4,9
	Aerosols and Particulates—Organic vapors, mists, particulates	2,3,4
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8

Table 3-1. (continued).

Tasks	Hazard(s) to be Monitored[a]	Instrument Category to be Used[b]
V-Tank Remediation Task 7 - Miscellaneous Sample and Waste Transfer		
• Transfer ARA-16 Materials to Consolidation Tank No. 3 (or predetermined waste container) • Return TSF-05,/ WAG 1 Laboratory Samples, and altered/unaltered samples to Consolidation Tank No. 3 (or predetermined waste container) • Return TAN D&D VCO Waste to Consolidation Tank No. 3 (or other waste container)	Ionizing radiation—(alpha, beta, gamma, fissile material)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical constituents—organic vapors, hazardous atmospheres	3,4
	Aerosols and Particulates—Organic vapors, mists, particulates	3,4
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8
V-Tank Remediation Task 8 - Confirmation/RCRA Closure Sampling and Phase 3 Excavation		
• Collect Samples from Bottom of Excavation Area and Tank Footprints • Excavate Soils Exceeding RAO Levels • Collect Additional Confirmation Samples as Required	Ionizing radiation—(alpha, beta, gamma)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical and nonradiological constituents, hazardous atmospheres	3,4
	Respirable dusts and other particulates of concern	2,3,4,5
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8
V-Tank Remediation Task 9 - Site Backfilling and Revegetation		
• Backfill excavation • Compact excavation • Add clean soil layer (SSA only) • Revegetate area (SSA only)	Respirable dusts and other particulates of concern	2,3,4,5
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8

Table 3-1. (continued).

Tasks	Hazard(s) to be Monitored[a]	Instrument Category to be Used[b]
V-Tank Remediation Task 10 – Air Sparging Consolidation Tank and Sampling		
• Air Sparge consolidation tank • Monitor and sample consolidation off-gas and liquids	Ionizing radiation—(alpha, beta, gamma)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical constituents—organic vapors	3, 4
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8
Activity or Task 11: Treated Waste Transfer and Solidification (Solidification in V-Tanks V-1, -2, and –3)		
• Transfer of Treated (LDR Compliant) V-Tanks Waste to V-Tanks V-1, -2, and –3, • Waste Solidification	Ionizing radiation—(alpha, beta, gamma, fissile material)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical constituents—organic vapors, hazardous atmospheres	3,4,9
	Aerosols and Particulates—Organic vapors, mists, particulates	2,3,4
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8
Remediation Task 12 – New Sites Excavation and Remediation		
• Excavate soils to the soil storage area (SSA) or designated waste container • Transport soils to disposal facility • Backfill excavation and revegetate area	Ionizing radiation—(alpha, beta, gamma)	1
	Radionuclide contamination—(alpha, beta, gamma)	2
	Chemical and nonradiological constituents, hazardous atmospheres	3, 4
	Respirable dusts and other particulates of concern	3,4,5
	Hazardous noise	6
	Ergonomics, repetitive motion, lifting	7
	Heat and cold stress	8

a. Monitoring and sampling will be conducted as deemed appropriate by project Industrial Hygiene and RadCon personnel based on specific tasks and site conditions.
b. See Table 3-2.

Table 3-2. Monitoring instrument category and description.

Instrument Category	Instrument Category Number Description[a]
1	Alpha: Count rate—Bicron/NE Electra (DP-6 or AP-5 probe) or equivalent. Stationary—Eberline RM-25 (HP-380AB or HP-380A probe) or equivalent.
	Beta-gamma: Count rate—Bicron NE/Electra (DP-6, BP-17 probes) or equivalent. Stationary—Eberline RM-25 (HP-360AB probe) or equivalent.
2	CAM (alpha)—ALPHA 7-A-1 (in-line and radial sample heads, pump, RS-485) or equivalent (as required). CAM (beta)—AMS-4 (in-line and radial head, pump RS-485) or equivalent (as required). Grab sampler—SAIC H-810 or equivalent.
3	Organic vapor: Direct reading instruments (photoionization detector, flame ionization detector, or infrared detector) detector tubes, or grab samples.
	Dust: Direct-reading instrument (miniram).
4	Organic vapors and other airborne constituents, particulate or hazardous atmospheres: Personal sampling pumps with appropriate media for partial and full period sampling using NIOSH or OSHA-validated methods, direct reading instruments, or remote sensing detectors.
5	Silica dust, respirable: NIOSH 7500 or equivalent, personal sampling pump, 10-mm cyclone, full-period sampling.
6	ANSI Type S2A sound level meter or ANSI S1.25-1991 dosimeter (A-weighted scale for time-weighed average dosimetry, C-weighted for impact dominant sound environments).
7	Observation and ergonomic assessment of activities in accordance with MCP-2692 “Ergonomic Program,” and ACGIH TLV.
8	Heat stress: wet-bulb globe temperature, body weight, fluid intake.
	Cold stress: ambient air temperature, wind chill charts.
9	Mercury: Jerome mercury vapor analyzer or equivalent

a. Equivalent instrumentation other than those listed may be used.

Table 3-3. Action levels and associated responses for identified hazards.

Contaminant/Agent Monitored	Action Level	Response Taken If Action Levels Are Exceeded
Nonradiological airborne contaminant (chemical, dust fume, fiber or particulate)	Based on individual contaminant exposure limit (ACGIH TLV or OSHA PEL) and 29 CFR 1910 or 1926 substance-specific requirements. Action levels based on the TLV or PEL from TWA measurements will be at 50% of the TLV or PEL. A,sustained level at or above the TLV or PEL (but below ceiling values or substance-specific action limits) in the worker's breathing zone for two minutes will be considered the action level. Where ceiling values or OSHA substance-specific action limit exists, use these values. (direct reading instrumentation)	1. Remove potentially exposed personnel from work area where the action levels are reached. 2. Substitute equipment or change method to reduce emissions at source 3. Verify engineering control operation (where in place) or institute engineering controls 4. Evaluate air movement (wind) conditions reschedule tasks or reposition personnel to upwind position of source 5. Move operation to alternant location (with engineering controls if possible) 6. IF engineering and administrative controls do not control contaminant below exposure limit, THEN reevaluate engineering and administrative controls or don respiratory protection[a] (as directed by IH) 7. IF OSHA substance-specific standard action limit is exceeded, THEN initiate applicable medical surveillance requirements.
Nonradiological hazardous atmosphere Chemical immediately dangerous to life or health (IDLH), oxygen deficient, oxygen enriched, 10% of chemical lower explosive limit (LEL) Chemical IDLH, oxygen deficient, oxygen enriched, 10% of chemical LEL	As defined by MCP-2749, confined spaces are based on criteria such as oxygen level, individual contaminant IDLH value, and LEL. **NOTE:** *This is provided as a contingency only. If the excavation-competent person suspects that a hazardous atmosphere exists, they must contact the project IH for further evaluation.* *No entry into an area or space*	1. IF engineering control fails to control contaminant below safe atmospheric and exposure limit, THEN stop operation and evacuate personnel immediately until safe atmosphere and specified entry conditions can be achieved including the following: • Stop work and each employee shall leave the space immediately. • The space shall be evaluated to determine how the hazardous atmosphere developed • Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent

Table 3-3. (continued).

Contaminant/Agent Monitored	Action Level	Response Taken If Action Levels Are Exceeded
	containing a hazardous atmosphere is permitted without the authorization of the project operations manager, or representative, in conjunction with health and safety professionals. This authorization will be demonstrated through the use of approved operational procedures or other work control documents in conjunction with a confined space entry permit (MCP-2749).	entry takes place. 2. Eliminate hazardous atmosphere through use of engineering controls 3. Reschedule operations when area or space will not have hazardous atmosphere. 4. Evaluate space or area to be entered. IF the operation can be conducted outside the area or space, THEN perform operation without entry. 5. Measure atmosphere before initiating operation or personnel entry and verify acceptable entry conditions have been met (e.g., oxygen and LEL) and use engineering controls to maintain safe atmosphere and below specified exposure limit. Use permit system to authorize entry. **NOTE:** *The INL fire department also must be notified for any area or space entry into an IDLH atmosphere to ensure adequate rescue equipment and resources are in place.*
Particles (Insoluble or Poorly Soluble, Not Otherwise Specified [PNOS])	>10 mg/m^3 (inhalable fraction) >3 mg/m^3 (respirable fraction)	Move personnel to upwind position of source and close equipment cab windows and doors. Use wetting or misting methods to minimize dust and particulate matter. **IF** wetting or misting methods prove ineffective, **THEN** don respiratory protection[a] (as directed by industrial hygienist).
Hazardous noise levels	<85 decibel A-weighted (dBA) 8-hr time-weighted average (TWA), <83dBA 10-hr TWA	No action.
	85 to 114 dBA	Hearing protection required to attenuate hazard to below 85 dBA 8-hour TWA or 83 dBA for 10-hour TWA (device noise reduction rating [NRR]).
	(a) >115 dBA (b) >140 dBA	(a) Isolate source, evaluate NRR for single device, double protection as needed. (b) Control entry, isolate source, only approved double protection worn.
Radiation field (Dose Rate)	<5 mrem/hour	No action, no posting required.

Table 3-3. (continued).

Contaminant/Agent Monitored	Action Level	Response Taken If Action Levels Are Exceeded
	5 to 100 mrem/hour @ 30 cm (10 CFR 835.603b)	1. ALARA committee meeting and evaluation of individual workers ALARA goals or doses 2. Prejob planning and dry runs as deemed appropriate 3. Placement of shielding as feasible. 4. Required Posting: Caution, Radiation Area 5. Supplemental Posting: RWP and Personnel Dosimeter Required for Entry 6. Required Training: Radiological Worker I or II training.
	>100 mrem/hour to Radiation field (Dose Rate) 500 Rad @ 100 cm (10 CFR 835.603b)	**No entry unless authorized by the project operations manager (or designated alternate) with approval from RadCon personnel in consultation with the project radiological engineer.** 1. ALARA committee meeting and evaluation of individual workers ALARA goals or doses 2. Prejob planning and dry runs as deemed appropriate 3. Prejob briefing (as applicable) 4. Placement of shielding as feasible. 5. Required posting: Caution or Danger, High-Radiation Area 6. Supplemental posting: Personnel Dosimeter, Supplemental Dosimeter, and RWP Required for Entry 7. Required training: Radiological Worker I (with high-radiation area training) or II training.

Table 3-3. (continued).

Contaminant/Agent Monitored	Action Level	Response Taken If Action Levels Are Exceeded
Radioactive contamination	1 to 100 times Radiological Control Manual[b] Table 2-2 values (10 CFR 835.603d)	1. Bioassay submittal (as required) 2. Respiratory protection (as deemed appropriate) 3. Required posting: Caution, Contamination Area 4. Supplemental posting: RWP and Protective Clothing Required for Entry 5. Required training: Radiological Worker II training.
	>100 times Radiological Control Manual[b] Table 2-2 values (10 CFR 835.603d)	**No entry unless authorized by the project operations manager (or designated alternate) with approval from RadCon personnel in consultation with the project radiological engineer.** 1. ALARA committee meeting and evaluation of individual workers ALARA goals or doses 2. Prejob planning and dry runs as deemed appropriate 3. Prejob briefing 4. Supplied breathing air (as deemed appropriate) 5. Bioassay submittal (as required). 6. Required Posting: Danger, High-Contamination Area, RWP Required for Entry 7. Supplemental posting: RWP and Protective Clothing Required for Entry 8. Required training: Radiological Worker II training.

Table 3-3. (continued).

Contaminant/Agent Monitored	Action Level	Response Taken If Action Levels Are Exceeded
Airborne radioactivity	Concentrations (μCi/cc) >30% of one derived air concentration value (10 CFR 835.603d)	**No entry unless authorized by the project operations manager (or designated alternate) with approval from RadCon personnel in consultation with the project radiological engineer.** 1. ALARA committee meeting and evaluation of individual workers ALARA goals or doses 2. Prejob planning and dry runs as deemed appropriate 3. Prejob briefing 4. Respirator 5. Bioassay submittal and lung count (as deemed appropriate) 6. Required posting: Caution, Airborne Radioactivity Area, RWP Required for Entry 7. Supplemental posting: RWP and Protective Clothing Required for Entry 8. Required Training: Radiological Worker II training.
Heat and cold stress	As defined in MCP-2704	As defined in MCP-2704 and based on IH professional judgment.
Response to abnormal radiological conditions or alarms	Supplemental radiation dosimetry or area radiation monitor alarm	1. Stop work activities and place the area in a safe condition (i.e., secure excavator equipment, terminate activities that may result in more severe conditions) 2. Alert others 3. Affected individuals exit the area 4. Notify RadCon personnel.

Table 3-3. (continued).

Contaminant/Agent Monitored	Action Level	Response Taken If Action Levels Are Exceeded
	PCM alarm	1. Remain in the immediate area 2. Notify RadCon personnel 3. Take actions to minimize cross-contamination (e.g., putting a glove on a contaminated hand) 4. Take follow-up actions in accordance with Article 541 of the INEEL RCM Article 541 (PRD-183).
	CAM alarm	1. Stop work activities and place the area in a safe condition (i.e., secure excavator equipment, terminate activities that may result in more severe conditions) 2. Warn others in area and exit the area 3. Notify RadCon personnel.
	Criticality alarm (if required)	1. Immediately evacuate the area, without stopping to remove protective clothing or perform exit monitoring 2. Report to designated assembly area.
	Spill of radioactive material	1. Stop or secure the operation causing the spill 2. Warn others in the area 3. Isolate the spill area if possible 4. Minimize individual exposure and contamination 5. Secure unfiltered ventilation 6. Notify RadCon personnel.
Other facility or INL alarms	Project operations, TAN or INL alarm	See Section 10.6 for emergency response action following facility or INL alarms.

a. Level C respiratory protection will consist of a full-face respirator equipped with a high-efficiency particulate air filter cartridge as prescribed by the project Industrial Hygiene and Radiological Control personnel (based on contaminant of concern). See Section 5 for additional Level C requirements.

b. *Manual 15A - Radiation Protection – INL Radiological Control Manual* (PRD-183).

Various direct-reading instruments may be used to determine the presence of nonradioactive and other physical agents. The frequency and type of sampling and monitoring will be determined by changing site conditions, direct-reading instrument results, observation, professional judgment, and in accordance with the MCP-153, "Industrial Hygiene Exposure Assessment" process and HASS documented exposure assessment.

All monitoring instruments will be maintained and calibrated in accordance with the manufacturer's recommendations, existing IH protocol, and in conformance with MCP-2391, "Control of Measuring and Test Equipment ," and in conformance with the companywide safety and health manuals, *Manual 14A – Safety and Health*, *Occupational Safety and Fire Protection* (Safety and Health Department 2004a) and *Manual 14B - Safety and Health Occupational Medical and Industrial Hygiene* (Safety and Health Department 2004b). Calibration information, sampling and monitoring data, results from direct-reading instruments, and field observations will be recorded as stated in Section 12.

3.2.2 Radiological Monitoring and Instrument Calibration

Portable direct-reading radiological instrumentation will be used during project operations may include alpha and beta-gamma continuous air monitors (CAMs) positioned in strategic locations identified by RadCon personnel. Stationary beta-gamma and alpha self-survey instruments for hand monitoring will be located in close proximity to all radiological area entry/exit points. Personnel contamination monitors (PCMs) for automated whole-body survey will be located within TAN-607. Additionally, scalers, high-volume samplers, lapel samplers, and other instrumentation will be available to collect and quantify radiological contamination levels as deemed appropriate by RadCon personnel.

Radiological monitoring of radiation and contamination will be conducted during project activities to ensure that personnel are given adequate protection from potential radiological exposure. Instruments and sampling methods listed in Table 3-2 may be used by the RCT as deemed appropriate and as required by general or task-specific RWPs. When conducted, monitoring will be performed in accordance with *Manual 15B - Radiation Protection Procedures* (Radiological Control Department 2004b) and *Manual 15C - Radiological Control Procedures* (Radiological Control Department 2004c). The data obtained from monitoring will be used by RadCon personnel to evaluate the effectiveness of project engineering controls, decontamination methods and procedures, and to alert personnel to potential radiation sources.

All portable survey instruments will be source-checked to ensure they are within the specified baseline calibration limits. Accountable radioactive sources will be maintained in accordance with MCP-137, "Radioactive Source Accountability and Control." All radiological survey and monitoring equipment will be maintained and calibrated in accordance with the manufacturer's recommendations, existing RadCon protocol, in accordance with *Manual 15B - Radiological Protection Procedures* and in conformance with MCP-93, "Health Physics Instrumentation."

3.2.3 Personnel Radiological Exposure Monitoring

Personal radiological monitoring will be conducted during project activities to quantify radiation exposure and potential for uptakes as stated in the general or task-specific RWP. This will include the use of external dosimetry, surface monitoring, and internal dosimetry methods to ensure that engineering controls, administrative controls, and work practices are effectively mitigating radiological hazards. General as-low-as-reasonably-achievable (ALARA) considerations are discussed further in Section 4.4.

3.2.3.1 External Dosimetry. Dosimetry requirements will be based on the radiation exposure potential during project activities. All personnel who enter project radiation areas will be required to wear a minimum of a thermoluminescent dosimeter (TLD) and other personal dosimetry devices (e.g., albedo dosimetry) specified by RadCon personnel, in applicable RWPs, and in accordance with the *Manual 15A - INL Radiological Control Manual* (PRD-183).

The Radiological Control and Information Management System (RCIMS) (Radiological Control Department 2004d) will be used to track external radiation exposures to project personnel and to serve as the administrative control mechanism for working in accordance with individual RWPs. Individual project personnel are responsible for ensuring all required personal information is provided to RadCon personnel for entry into RCIMS and logging in when electronic dosimeters are used.

3.2.3.2 Internal Monitoring. The purpose of internal dose monitoring is to demonstrate the effectiveness of contamination control practices and to document the nature and extent of any internal uptakes that may occur. Internal dose evaluation programs will be adequate to demonstrate compliance with 10 CFR 835, "Occupational Radiation Protection." The requirement for whole body counts, lung counts, and bioassays will be based on specific V-Tanks remedial project operational evaluations conducted by the assigned radiological engineer. Select project personnel may be entered into a radionuclide-specific bioassay program based on the hazards associated with individual job functions. Bioassay requirements will be specified on the RWP and project personnel will be responsible for submitting required bioassay samples upon request.

4. ACCIDENT AND EXPOSURE PREVENTION

Project activities will present numerous hazards to personnel conducting these tasks. It is critical that all personnel understand and follow the site-specific requirements of this HASP. Engineering controls, hazard isolation, specialized work practices, and the use of PPE will all be implemented to eliminate or mitigate potential hazards and exposures where feasible. However, all personnel are responsible for the identification and control of hazards in their work area in accordance with Integrated Safety Management System (ISMS) principals and practices. At no time will hazards be left unmitigated without implementing some manner of controls (e.g., engineering controls, administrative controls or the use of PPE). Project personnel should use stop work authority in accordance with MCP-553, "Stop Work Authority," where it is perceived that imminent danger to personnel, equipment, or the environment exists.

This HASP is to be used in conjunction with INL PRD-25, "Activity Level Hazard Identification, Analysis, and Control," and work authorization and control documents such as STD-101, "Integrated Work Control Process," work orders, JSAs, MCP-3562, "Hazard Identification, Analysis, and Control of Operational Activities," and operational technical procedures. Where appropriate, MCP-3562 and GDE-6212, "Hazard Mitigation Guide for Integrated Work Control Process," mitigation guidance, JSAs, and RWPs will be incorporated into applicable sections of the HASP.

4.1 Voluntary Protection Program and Integrated Safety Management

The INL safety processes embrace the Voluntary Protection Program (VPP) and ISMS criteria, principles, and concepts to identify and mitigate hazards, thereby preventing accidents. All management and workers are responsible for implementing safety policies and programs and for maintaining a safe and healthful work environment. Project personnel are expected to take a proactive role in preventing accidents, ensuring safe working conditions for themselves and fellow personnel, and complying with all work control documents, procedures, and permits.

The ISMS is focused on the system side of conducting operations. The Voluntary Protection Program concentrates on the people aspect of conducting work. Both programs define work scope, identify and analyze hazards, and mitigate the hazards. Additional information on these programs is available on the INL Intranet. This document incorporates all elements of both systems. Table 4-1 provides a summary of how these two programs are addressed by this HASP.

Table 4-1. VPP and ISMS requirements corresponding to sections of the health and safety plan.

Voluntary Protection Program	Integrated Safety Management System	Project Operations Health and Safety Plan Section
Work site analysis	Define work scope	Section 1
	Analyze hazards	Sections 2, 3, 5 and 8
Hazard prevention and control	Develop and implement controls	Sections 2, 3, 4, 5, 7, 10 and 11
Safety and health training	Perform within work controls	Section 6
Employee involvement		Sections 2, 3 and 4
Management leadership	Provide feedback and improvement	Sections 6 and 9

4.2 General Safe-Work Practices

Sections 1 and 2 defined the project scope of work and associated project-specific hazards, controls, and mitigation. Section 3 provided the exposure monitoring and sampling strategy for ensuring the effectiveness of safety systems and engineering control and to identify changing conditions. The following general safe-work practices are provided to further reduce the likelihood of accidents and injuries and are mandatory for all project personnel. All visitors permitted to enter work areas must also follow these requirements. Failure to follow these practices or other project requirements may result in permanent removal from the project and other disciplinary actions. The project FTL and HSO will be responsible for ensuring the following safe-work practices are adhered to at the project site:

- Limit access to project areas to authorized personnel only, in accordance with PRD-1007, "Work Coordination and Hazards Control" or STD-101, "Integrated Work Control Process."
- Personnel must be aware of and comply with all safety signs, tags, barriers, and color codes as identified in PRD-5117, "Accident Prevention Signs, Tags, Barriers, and Color Codes."
- Be familiar with the physical characteristics of the project site, consolidation tank skid and operational requirements, including, but not limited to the following:
    - Layout of the soil sites, consolidation tank skid and weather enclosure, V-Tanks and SSA areas, V-Tank treated waste transfer facility, controlled areas, and egress routes
    - Project waste types, labeling, and storage requirements
    - Project and facility safety-significant structures, systems, and components; technical safety requirements; and limiting conditions of operation
    - TAN facility warning devices and alarms
    - Communications with the project and TAN shift supervisors
    - Major TAN roads and means of access to and from the V-Tank and new sites project areas
    - Location of facility emergency response equipment and first-aid supplies.
- Personnel shall be alert for dangerous situations (e.g., slip/trip/fall hazards, facility alarms, spills, accidents, and injuries) and report dangerous situations and near misses to the FTL. The shift supervisor will make required notification in accordance with Section 10.
- Personnel must provide adequate information to the incoming shift personnel, including equipment and system status and inspection logs, and communicate all systems, monitors, and safety components per *Conduct of Operations*, Manual 9.
- Personnel shall plan and review all operational tasks before initiating the activity. Verify all work control documents (e.g., the RWP, JSA, technical procedure (TPR), fall hazard prevention analyses (FHPA), or work order) are current and correct for the activity. A prejob briefing is required to be conducted for all activities in accordance with MCP-3003, "Performing Prejob Briefings and Post-Job Reviews."
- Conduct all project operational activities in accordance with the applicable TPR or work order. All operational activities will be conducted as stated in the applicable work control document including hold points and requirements for initials upon completion of certain steps (use Type 1 TPR only) or work orders. Use Type 2 TPRs will be followed in a step-by-step sequence.

NOTE: *It is the responsibility of all project personnel to identify, understand, and follow the appropriate work controls for their operational activities.*

- Personnel shall have the authority to initiate STOP WORK actions in accordance with MCP-553, "Stop Work Authority."
- Personnel shall be familiar with project site and consolidation tank skid and weather enclosure, off-gas equipment for which they are responsible to operate including operating limitations, maintenance, inspection, and manufacturer's operating instructions requirements. Tools and equipment shall only be used for their intended use.
- Understand the PPE requirements for all tasks as stated on the applicable JSA or work order. This includes the proper use and limitation of all PPE. If questions arise about PPE, contact the assigned IH, SP, or RCT as applicable.
- Personnel must wear all required dosimetry as stated on the RWP. This includes any supplemental dosimetry (e.g., electronic dosimeters and albedo dosimeters). Respond to all radiological alarms including but not limited to CAMs, radiation, and PCM alarms.
- Avoid direct contact with project waste material or containers. Personnel shall not walk through spills or other areas of contamination and shall avoid kneeling, leaning, or sitting on equipment or surfaces that may be contaminated.
- Project personnel shall not eat, drink, chew gum or tobacco, smoke, apply cosmetics or sunscreen, or perform any other practice that increases the probability of hand-to-mouth transfer and ingestion of materials in the new sites, V-tank, SSA or consolidation weather enclosure operational areas. These activities will only be permitted within designated administrative break areas and only after having completed required contamination surveys.
- Practice good housekeeping at all times. Turn in or place tools in the designated storage location after use. Put waste materials in the appropriate waste container or receptacle. If there is a question as to where to dispose of a waste article, personnel should ask the supervisor or the shift supervisor.
- Additional health, safety, and radiological requirements will be identified in project operations technical procedures and work packages.
- Illumination levels during project tasks will be in accordance with 29 CFR 1910.120 (Table H-120.1, "Minimum Illumination Intensities in Foot-Candles").

Where subcontractors are used to support project activities, subcontractors are responsible for meeting all applicable INL MCP, PRD, VPP, and ISMS flow-down requirements such as those listed on the completed INEEL Form 540.10, "Subcontractor Requirements Manual (SRM) Applicability," *Subcontractor Requirements Manual* (TOC-59); and contract general and special conditions. Additionally, subcontractors are expected to take a proactive role in hazard identification and mitigation while conducting operational support tasks. Subcontractors will report unmitigated hazards to the FTL after taking protective actions (within the documented work controls) and emergency protective actions (e.g., evacuate from the area and warn others).

4.3 Radiological and Chemical Exposure Prevention

The project equipment, processes, and facilities (i.e., consolidation tank trailer operational area) have been designed to isolate (confine) the radiological and chemical contaminants during V-Tanks and new sites remedial actions. The concept of defense-in-depth has been applied to confine the most significant hazards and provide additional barriers, engineering controls, access restrictions, and administrative controls to abate radiological and chemical exposure to project personnel. Where entry into potentially or known contaminated areas is required, chemical, radiological, and physical hazards will be mitigated through the use of work procedures and hold points, area and personnel monitoring, and PPE where possible or to minimize them where engineering controls are not feasible. All project personnel are responsible for understanding the hazard identification and mitigation measures necessary to prevent or reduce exposures. This section presents radiological and chemical exposure prevention strategies for use where engineering controls are not feasible and as good work practices.

4.3.1 Radiological Exposure Prevention – ALARA Principles

Radiation exposure of project personnel will be controlled such that radiation exposures are well below Occupational Radiation Protection (10 CFR 835) regulatory limits (as-low-as reasonable achievable [ALARA]) and that there is no radiation exposure without commensurate benefit. All project tasks will be evaluated with the goal of eliminating or minimizing exposures and project personnel have the responsibility for following ALARA principles and practices. Unplanned and preventable exposures are considered unacceptable. Personnel working at the site must strive to keep both external and internal radiation doses ALARA by following the practices described below.

Monitoring for radiation and contamination during project tasks will be conducted as described in Section 3.2 and in accordance with the RWP; PRD-183, *Manual 15A—Radiation Protection—INL Radiological Controls; Manual 15B—Radiation Protection Procedures; Manual 15C—Radiological Control Procedures*; and as deemed appropriate by RadCon personnel.

4.3.1.1 External Radiation Dose Reduction. Sources for external radiation exposure will be primarily radioisotopes in the V-tank waste and other sample and waste material returned to the consolation tank and from excavated soils from the new site areas. Project operational processes have been designed to minimize radiation dose to workers using barriers and shielding. Area radiation monitors will be used to alert project personnel if radiation levels increase in project work areas. Personal supplemental electronic dosimetry will be programmed to alarm at radiation levels much below the area monitors.

The RWPs written for project activities will define radiological hold points, required dosimetry, RCT coverage, radiological controlled areas, and radiological limiting conditions in accordance with MCP-7, “Radiological Work Permit.” Radiological Control personnel will participate in the prejob briefing required by MCP-3003, “Performing Prejob Briefings and Postjob Reviews,” to ensure all personnel understand the dose rate limits and limiting conditions on the RWP. All personnel will be required to read and acknowledge the RWP requirements before being allowed to sign the RWP (or scan the RWP bar code in the Radiological Control and Information Management System [RCIMS]) and obtain electronic dosimetry.

Basic ALARA protective measures used to reduce external doses include: (1) minimizing time in radiation areas, (2) maximizing the distance from known sources of radiation, and (3) using shielding whenever possible. Specific examples of these methods are provided in the following subsections.

4.3.1.1.1 Methods for Minimizing Time in Radiation Areas—Project personnel will incorporate the following methods for minimizing time in radiation areas:

- Preplan all work activities and conducting dry runs where necessary to validate procedures and equipment functional testing such as conduct mockups of the waste transfer process
- Plan and discuss the tasks before entering a radiation area (including having all equipment and tools prepared)
- Perform as much work as possible outside radiation areas and take advantage of lower dose rate areas (as shown on the radiological survey maps)
- Take the most direct route to the task area and work efficiently
- Hold technical and other discussions outside radiation areas if problems occur in the radiation areas, then return to the work area to complete the task
- Know stay time and use appropriate signal and communication method to inform others in the area when the stay time is up (if stay times are required)
- Respond to electronic dosimetry alarms by notifying others in the area and the RCT, and exit the radiation area through the designated entry and exit point
- Know individual current dose and dose limit (tracked on RCIMS).

NOTE: *If RCIMS indicates an individual is approaching or has exceeded the dose limit, the RCT should be notified immediately and the worker should not proceed into the radiation work area.*

4.3.1.1.2 Methods for Maximizing Distance from Radiation Sources—Project personnel will incorporate the following methods for maximizing the distance from radiation sources:

- Use remote operated equipment or controls where available
- Stay as far away from the source of radiation as possible (extremely important for point sources where, in general, if the distance between the source is doubled, the dose rate falls to one-fourth of the original dose rate)
- Become familiar with the radiological survey map for the V-tank project area and consolidation tank area where work will be performed, as well as high and low dose-rate locations, and take advantage of low dose-rate areas.

4.3.1.1.3 Proper Use of Shielding—Project personnel will incorporate the following methods for the proper use of shielding as a protective measure used to reduce external radiation doses:

- Know what shielding is required and how it is to be used for each radiation source
- Take advantage of the engineered consolidation tank shielding and temporary shielding area to minimize the dose rate from radiation sources
- Verify interlocks are functional (where required) and place temporary shielding as required by the RWP prior to initiating the flow of waste material into the material handling and consolidation system
- Wear safety glasses to protect eyes from beta radiation.

4.3.1.2 Internal Radiation Dose Reduction.

An internal dose results from radioactive material being taken into the body. Radioactive material can enter the body through inhalation, ingestion, absorption through wounds, or injection from a puncture wound. Reducing the potential for radioactive material to enter the body is critical to avoid an internal dose.

The most significant internal radiation dose potential exists during waste removal, and piping and tank removal activities where personnel may be exposed to the contents of the tanks and associated piping. Exposure to soil that may have been contaminated with tank contents during excavation tasks also presents an uptake risk. The following are methods to minimize the hazard of an internal radiation dose:

- Preplan all work activities and conduct dry runs where necessary to validate procedures and equipment functional testing
- Verify CAMs and other area contamination monitors and samplers are functional before entry into contamination or airborne radioactivity areas (if established)
- Review the RadCon survey map for areas of known contamination and potential high contamination sources and minimize or avoid activities in those areas (where possible)
- Wear protective clothing and respiratory protection as identified on the RWP, perform all respirator leak checks, and inspect all PPE before entering contaminated areas or areas with airborne radioactivity (if established)
- When inside contaminated areas, do not touch your face (adjust glasses or PPE) or other exposed skin
- Respond to all CAM alarms or other indications of increased contamination levels (RCT directions)
- When exiting contaminated areas, follow all posted instructions and remove PPE in the order prescribed (if questions arise, consult RadCon personnel)
- Conduct whole-body personnel survey when exiting the contaminated area, then proceed directly to the PCM
- Report all wounds or cuts (including scratches and scrapes) before entering radiologically contaminated areas
- Wash hands and face before eating, drinking, smoking, or engaging in other activities that may provide a pathway for contaminants.

Monitoring for radiation and contamination during protect tasks will be conducted in accordance with the RWP, PRD-183, Companywide Manuals 15A, 15B, and 15C, and as deemed appropriate by RadCon personnel.

4.3.2 Chemical and Physical Hazard Exposure Avoidance

NOTE: *Identification and control of exposures to carcinogens will be conducted in accordance with MCP-2703, "Carcinogens."*

The primary potential for exposure to nonradiological contaminants is the same as the radiological sources (i.e., V-Tanks waste, contaminated piping, tanks, and miscellaneous samples/waste to be returned). Additionally, chemicals (e.g., fuels, lubricants, and cleaners) will be used in support of project

activities. Project personnel will be required to have an MSDS for all chemicals used in accordance MCP-2715, "Hazard Communication." All chemicals entering the project must be entered into and tracked using the INL Chemical Management System (ICMS). The ICMS is used for maintaining and tracking the inventory of chemical containers and basic functionality includes the following:

- Identify container
- Track the location and location changes of a container
- Define the contents of a container at any point in time
- Record distributions into and out of a container
- Record distributions to a waste stream
- Provide a running inventory based on the distributions entered
- Produce regulatory reports from the data entered
- Calculate conversions from one unit of measure to another
- Define container update authorization for a location
- Provide flexibility in how to manage chemicals.

NOTE: *Project waste streams are not considered chemicals for purposes of entry into ICMS.*

Threshold-limit values (TLVs) or other occupation exposure limits have been established for numerous chemicals and physical agents (e.g., noise, heat, or cold stress) that may be encountered. These exposure limits provide guidelines in evaluating airborne, skin, and physical agent exposures. The TLVs represent levels and conditions under which it is believed that nearly all workers may be exposed day after day without adverse health effects. The TLV-time-weighted average (TWA) is a TWA concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects. Action limits (instantaneous concentrations for short time periods) have been established to further reduce the likelihood of exceeding TLVs or as regulatory triggers for additional medical surveillance and actions. These concentrations for nonradiological contaminants of concern are provided in Table 2-1.

The waste removal, and consolidation processes and systems have been designed to confine the radiological and chemical contaminants of concern. Design features include a negative pressure HEPA and granular activated carbon filtration, remote waste handling equipment and tools, and double confinement barriers where appropriate. These controls will eliminate or mitigate chemical and physical hazards to a great extent.

Where personnel are required to enter the V-Tanks area during waste removal, tank and piping removal, collect soil samples from the excavation area, and/or for consolidation tank skid operations, additional exposure monitoring and PPE will be required. Respiratory protection and protective clothing is available for personnel required to enter contaminated or suspected contaminated areas to perform these tasks. In addition, use of technical procedures and work orders, hold points, training, and monitoring of hazards will be used to reduce exposure potential. Some other chemical and nonradiological exposure minimization methods include the following:

- Preplan all work activities and conduct dry runs where necessary to validate procedures and equipment functional testing

- Wear all required PPE, inspecting all pieces before donning, and taping all seams
- Change PPE if it becomes damaged or shows signs of degrading
- Minimize time in direct contact with hazardous material or waste
- Doff PPE following posted radiological instructions (i.e., rolling outer surfaces in and down) and follow radiological doffing sequence
- Wash hands and face before eating, drinking, smoking, or engaging in other activities that may provide a pathway for contaminants.

Exposure to nonchemical hazards (e.g., hazardous noise) and physical hazards will be controlled through the implementation of existing INL MCPs and PRDs in conjunction with the PRD-25 process as described in Section 2. New or previously unidentified hazards shall be reported to the appropriate health, safety, or RadCon personnel for evaluation and to determine the appropriate controls.

4.4 Buddy System

The two-person or buddy system will be used during some project activities. The buddy system is most often used during activities requiring the use of protective clothing and respiratory protection where heat stress and other hazards may impede a person's ability to self-rescue or in situations that are immediately dangerous to life or health (IDLH). The buddy system requires each employee to assess and monitor his or her buddy's mental and physical well being during the course of the operation. A buddy must be able to perform the following activities:

- Provide assistance if required
- Verify the integrity of PPE
- Observe his or her buddy for signs and symptoms of heat stress, cold stress, or contaminant exposure
- Notify other personnel in the area if emergency assistance is needed.

The need to use the buddy system during project activities will be determined by the assigned IH in conjunction with the shift supervisor and RadCon personnel. ALARA considerations will be evaluated when determining the need for the buddy system in radiologically controlled areas.

5. PERSONAL PROTECTIVE EQUIPMENT

Project designed safety systems, components, and confining barriers will serve as the primary hazard controls during TAN new sites remediation and V-Tank remedial actions to confine radiological and chemical waste hazards. Additionally, chemical and physical hazards will be encountered in conjunction with routine operational activities as presented in Section 2. Where hazards cannot be eliminated through engineering or administrative controls, PPE will be used to protect personnel.

This section provides guidance for the selection and use of PPE to be worn for project tasks and contingencies for upgrading and downgrading PPE. Types of PPE are generally divided into two broad categories: (1) respiratory protective equipment and (2) protective clothing. Both of these categories are incorporated into the primary levels of PPE anticipated for this project (Levels D and C, see Sections 5.2.1 and 5.2.2).

The purpose of PPE is to shield or isolate individuals from the chemical, physical, radiological, and safety hazards that may be encountered during project tasks when engineering and other controls are not feasible or cannot provide adequate protection. It is important to realize that no single PPE ensemble can protect against all hazards under all conditions and that proper work practices and adequate training will serve to augment PPE to provide the greatest level of protection to workers. The Idaho Completion Project (ICP) PPE policy requires that field workers wear, as a minimum, sturdy leather boots above the ankles, safety glass with side shields, and hard hats (Level D PPE).

The type of PPE will be selected, issued, used, and maintained in accordance with PRD-2001 or PRD-5121, "Personal Protective Equipment." Potential exposures and hazards associated with project activities will be monitored (as discussed in Section 3) during the course of the project to evaluate changing conditions and to determine PPE level adequacy and the need for modifications. Selection of the proper PPE is based on the following considerations:

- Specific conditions and nature of the tasks (e.g., soil excavation, waste removal, tank and piping removal, and decontamination)
- Potential contaminant routes of entry
- Duration and intensity of exposure (acute or chronic)
- Environmental conditions (e.g., humidity, heat, cold, rain)
- Physical form and chemical characteristics of project chemicals or waste contaminants
- Compatibility of chemical(s) with PPE materials and potential for degradation or breakthrough
- Acute and chronic effects from exposure to project chemicals or waste contaminants
- Local and systemic toxicity of project chemicals or waste contaminants
- Potential exposure levels (surface and airborne)
- The hazard analysis (Section 2) evaluation of this HASP.

MCP-432, "Radiological Personal Protective Equipment" will be followed for the selection and use of anti-contamination (anti-C) clothing. The RWP will specify the type of anti-C clothing.

5.1 Respiratory Protection

The primary objective will be to prevent or significantly reduce levels of atmospheric contamination (i.e., air contaminated with harmful dusts, fumes, mists, gases, smokes, vapors, or airborne radioactivity) to prevent inhalation of potential toxic substances. This will be accomplished as far as feasible through the implementation of existing V-Tank project engineering controls (e.g., HEPA-filtered off-gas systems and HEPA-filtered vacuum, S-GAC filtration was used during the transfer of the V-Tank content but will not be used during the Phase I Treatment process for VOC control which will now be controlled by the sparge rate), confinements, and barriers. Contaminant levels in and around the V-tanks enclosure will be monitored by the project industrial hygienist as discussed in table 3.3 of this document. The detected levels will provide the industrial hygienist with data to help determine if respiratory protection is warranted, although respiratory protection is not anticipated for personnel in and around the V-tanks enclosure.

New sites remediation controls will include the use of heavy equipment and limited contact/exposure with contaminants during removal and packaging. When effective engineering controls are not feasible or entry into the areas with airborne contaminants in excess of the actions limits, the appropriate type of respiratory protection will be selected and worn.

The type of respiratory protection for specific project activities will vary. Assigned protection factors for respiratory devices are listed in MCP-2726, "Respiratory Protection," Appendix B, "Protection Factors."

All personnel required to wear respirators shall complete training and be fit-tested before being assigned a respirator. Requirements for respirator use, emergency use, storage, cleaning, and maintenance, as stated in MCP-2726 shall be followed.

5.2 Personal Protective Equipment Levels

The following subsections provide general guidance on typical HAZWOPER levels of PPE. Project activities will be evaluated continually to determine the most appropriate PPE during the course of the project. Additional PPE requirements may be specified in JSAs, RWP, and SWP.

Table 5-1 lists PPE requirements for the two levels of PPE that are anticipated to be worn during the course of the project. Applicable PPE levels (Level D) will be required for conducting project tasks. Modifications to these levels will be made under the direction of the HSO in consultation with the project Industrial Hygiene and RadCon personnel, as appropriate. Such modifications are routinely employed during HAZWOPER site activities to maximize efficiency and to meet site-specific needs without compromising personnel safety and health. Table 5-2 lists the initial level of PPE anticipated for each project activity with the corresponding upgrade or downgrade based on site-specific conditions and monitoring results.

5.2.1 Level D Personal Protective Equipment

Level D PPE will only be selected for protective clothing and not on a site with respiratory or skin absorption hazards requiring whole-body protection. Level D PPE provides no protection against airborne chemical hazards, but rather is used for protection against surface contamination and physical hazards. Level D PPE will only be allowed in areas that have been characterized as having limited contamination hazards.

5.2.2 Level C Personal Protective Equipment

Level C PPE will be worn when the task site (chemical or radioactive) contaminants have been well-characterized indicating that personnel are protected from airborne exposures by wearing an air-purifying respirator with the appropriate cartridges, no oxygen-deficient environments exist (less than 19.5% at sea level), and that there are no conditions that pose immediate danger to life or health (IDLH).

Table 5-1. Levels and options of personal protective equipment.

Personal Protective Equipment Level	Personal Protective Equipment Required	Optional Personal Protective Equipment or Modifications
D	Coveralls or standard work clothes (coverall material type based on IH determination) Hard hat (unless working indoors with no overhead or falling debris hazards) meeting ANSI Z89.1 requirements Eye protection (safety glasses meeting ANSI Z87.1 requirements as a minimum) Hand protection (material based on type of work and hazardous materials being handled) Safety footwear (steel or protective toe and shank) meeting ANSI Z41 requirements or sturdy leather above the ankle for construction tasks.	Chemical or radiological protective clothing (Tyvek or Saranex) by the IH or RCT Chemically resistant hand and foot protection (e.g., inner and outer gloves and boot liners) Radiological modesty garments under outer protective clothing (as required by the RWP) Any specialized protective equipment (e.g., hearing protection, cryogenic gloves, face shields, welding goggles, and aprons). Hardhat when employees are exposed to making contact with low clearance obstructions, falling objects, and/or hoisting and rigging equipment.
C	Level D ensemble with the following respiratory and whole-body protection upgrades:[a] Full-face-piece air purifying respirator equipped with a National Institute of Occupational Safety and Health-approved high-efficiency particulate air (HEPA) filter or chemical combination cartridge (IH to specify cartridge type) **OR** An air hood operating at a minimum pressure of 6 cfm or a full-face-piece supplied air respirator with a 10-minute escape bottle, a self-contained breathing apparatus (SCBA) or an escape air-purifying combination HEPA or chemical cartridge (supplied air respirator hose length no more than manufacturer's specification and, under no circumstances, greater than 91m [300 ft]) _____ Standard Tyvek (or equivalent) coverall **OR** Chemical-resistant coveralls (e.g., Tyvek QC, Tychem 7500, or Saranex-23-P) (IH to specify material).	Chemical-resistant outer shoe or boot cover (IH or RCT to specify material) Inner chemical-resistant gloves with cotton liners (as determined by the IH and RWP) Outer chemical-resistant gloves (as determined by the IH) Radiological modesty garments under outer protective clothing (as required by RWP) Any specialized protective equipment (e.g., hearing protection, welding lens, and aprons). (Safety glasses not required if wearing a full-face respirator) Hardhat when employees are exposed to making contact with low clearance obstructions, falling objects or when there is a likelihood of contact with hoisting and rigging equipment.
a. Upgrades are determined by the industrial hygienist (IH) in conjunction with RadCon and safety professionals.		

Table 5-2. Task-based personal protective equipment requirements and modifications.

Task	Initial Level of Personal Protective Equipment	Upgrade Contingency	Downgrade Contingency	Upgrade or Downgrade Criteria	Personal Protective Equipment Modifications and Comments
• Mobilization, site setup, and establishing controlled areas • Attachment and installation of tank-lift hardware • System operability (SO) testing • Management self-assessment • Site backfilling and revegetation • Phase I Air sparging • New Sites excavation	D	D+	N/A	Upgrade to Level D+ when attaching or removing straps if contamination is detected on the outside of waste containers. Upgrade to fire–retardant PPE during hot work activities.	D+ protective clothing consists of Tyvek hooded coveralls (or equivalent). Fire-retardant PPE shall be used during hot work activities Leather gloves for all material handling tasks. Hearing protection in areas where noise level exceed 84 dBA. Hardhat when employees are exposed to making contact with low clearance obstructions, falling objects, and/or hoisting and rigging equipment., Safety glasses with side shields (unless wearing a full face respirator).
• Waste transfer and consolidation operations • Tank and pipe removal • Miscellaneous sample returns and waste transfer • Equipment decontamination • Consolidation tank, HEPA filter, S-GAC sampling	C	C+	D+	Upgrade to Level C+ if splashing during pipe removal and tank decontamination tasks. Upgrade to C+ where there is a potential for splashing of liquids such as during decontamination tasks and pipe content draining/removal. Downgrade to Level D+ for decontamination of small items using spray and wipe decontamination methods (no aerosolized) and for waste transfer tasks from containers where no airborne vapor/particulate hazard exists.	Level C respiratory protection defined by the IH and RadCon, based on airborne contaminant. Level C/D+ protective clothing consists of Tyvek (or equivalent) hooded coverall. Level C+ protective clothing consists of Saranex (or equivalent coated, hooded coverall). Double pair nitrile gloves during decontamination tasks. Leather gloves over nitrile for equipment and material handling before or after decontamination tasks. Leather gloves for all material handling tasks. Hearing protection in areas where noise level exceed 84 dBA.

Table 5-2. (continued).

Task	Initial Level of Personal Protective Equipment	Upgrade Contingency	Downgrade Contingency	Upgrade or Downgrade Criteria	Personal Protective Equipment Modifications and Comments
• Phase 1 soil excavation • Equipment installation • Phase 2 excavation • Placement of soil in soil storage area • Confirmation and RCRA closure sampling • Phase 3 excavation	D+	C	D	Upgrade to Level C if airborne concentrations exceed action limits. Downgrade to Level D if contact with potentially contaminated waste containers surfaces can be avoided or surveys show no detectable contamination on surfaces.	Level C respiratory protection defined by IH and RadCon, based on airborne contaminant. Level D+/C protective clothing consists of Tyvek (or equivalent) hooded coverall Nitrile or equivalent glove for all sampling tasks. Leather gloves for all material handling tasks. Hearing protection in areas where noise level exceed 84 dBA.

5.3 Personal Protective Clothing Upgrading and Downgrading

The project HSO, in consultation with the project IH (and RadCon personnel), will be responsible for determining when to upgrade or downgrade PPE requirements. Upgrading or downgrading of PPE based on changing site conditions or activities is a normal occurrence. Reasons for upgrading or downgrading are listed in the following subsections.

NOTE: *Personnel must inspect all PPE before donning and entry into any work zone. Items found to be defective or that become unserviceable during use, will be doffed and disposed of in accordance with posted procedures and placed into the appropriate waste stream. The PPE inspection guidance is provided in Table 5-3.*

5.3.1 Upgrading Criteria for Personal Protective Equipment

The level of PPE required will be upgraded for the following reasons and work will halt until PPE upgrading has been completed:

- Identification of new, unstable, or unpredictable site hazards
- Temporary loss or failure of any engineering controls
- Contaminants that present difficulty in monitoring or detecting
- Known or suspected presence of skin absorption hazards
- Identified source or potential source of respiratory hazard(s) not anticipated
- Change in the task procedure that may result in an increased contact with contaminants or meeting any of the criteria listed above.

5.3.2 Downgrading Criteria

The level of PPE will be downgraded under the following conditions:

- Elimination of hazard or completion of task(s) requiring specific PPE
- Implementation of new engineering or administrative controls that eliminate or significantly mitigate hazard
- Sampling information or monitoring data that show the contaminant levels to be stable and lower than established action limits
- Elimination of potential skin absorption or contact hazards.

NOTE: *The PPE requirement for specific project tasks is identified in Table 5-3. This list may be augmented by an SWP or RWP. Potential exposures and hazards will be monitored (as discussed in Section 3) during the course of the project to evaluate changing conditions and to determine PPE level adequacy and modifications.*

5.4 Inspection of Personal Protective Equipment

All PPE ensemble components must be inspected before use and when in use during project activities in accordance with PRD-2001 or PRD-5121. Once PPE is donned, self-inspection will serve as the principal form of inspection. If PPE should become damaged or degradation or permeation is

suspected, the individual wearing the PPE will inform others of the problem and proceed directly to the work area exit point. Following required surveys (as required) PPE will be doffed and replaced. In addition, all PPE that becomes grossly contaminated or presents a potential source for the spread of such contamination will be required to be decontaminated or replaced.

Table 5-3 provides a general inspection checklist for common PPE items. Not all PPE ensemble items listed may be required for project tasks. Where specialized protective clothing or respiratory protection is used or required, the manufacturer's inspection requirements in conjunction with regulatory or industry inspection practices will be followed. The assigned project IH, safety professional, or RCT should be consulted about specific PPE inspection criteria.

Table 5-3. Inspection checklist for personal protective equipment.

Personal Protection Equipment Item	Inspection
Respirators (full-face-piece air-purifying and supplied air respirators with escape-only SCBA bottles or escape cartridges)	Before use: • Verify that respirator is within 3 years of shelf life (MSA type). • Ensure airline matches the airline respirator to be used (black hose). • Inspect airline hose connections (sections of hose) to ensure all are threaded or permanent metal-to-metal connections (no quick disconnect pieces). • Check condition of the face piece, head straps, valves, connecting lines, fittings, and all connections for tightness. • Check cartridge to ensure proper type or combination are being used for atmospheric hazards to be encountered, and inspect threads and O-rings for pliability, deterioration, and distortion. • Check for proper setting and operation of regulators and valves, check all hose connections back to the breathing-air compressor, check the pressure to the airline station and on individual airline connections to ensure pressure is within required range (in accordance with the manufacturer's specifications).
Air hoods	Before use: • Ensure airline matches the air hood to be used (red hose). • Visually inspect all seams and surfaces for tears and cracks. • Pressurize air hood to check for pinholes or defective seams. Before entry into contaminated area: • Inspect all airline connections for tight fit (pull connections three times). • Ensure air compressor is providing a minimum of 110 psi when all personnel have airlines hooked up to the compressor manifold.

Table 5-3. (continued).

Personal Protection Equipment Item	Inspection
Level D and C clothing	Before use: • Visually inspect for imperfect seams, nonuniform coatings, and tears. • Hold PPE up to the light and inspect for pinholes, deterioration, stiffness, and cracks. • While wearing in the work zone: • Inspect for evidence of chemical attack such as discoloration, swelling, softening, and material degradation. • Inspect for tears, punctures, and zipper or seam damage. • Check all taped areas to ensure they are still intact.
Gloves	Before use: • Pressurize rubber gloves to check for pinholes: blow in the glove, then roll until air is trapped and inspect. No air should escape. • Leather gloves: • Inspect seams and glove surface for tears and splitting and verify no permeation has taken place.

6. PERSONNEL TRAINING

Training of project personnel is a key element to achieving effective hazard identification and mitigation. All assigned project personnel who access the V-Tanks remedial action areas and operations areas will be trained to requirements contained in this HASP and other applicable technical procedures, JSAs, RWPs, etc. Personnel will receive training, as specified in the applicable section of the HAZWOPER standard (29 CFR 1910.120), TAN, DOE, federal, state, and INL companywide manuals as applicable.

The TAN operations manager is responsible to ensure that personnel have an adequate level of facility knowledge, including a general overview of the facility, facility-specific hazards, safety, and applicable procedures.

Table 6-1 is a training guide provided to address basic HAZWOPER and radiological training requirements based on entry to V-Tanks remedial actions project and operations areas. Table 6-1 summarizes the project-specific training requirements for personnel-based access requirements, responsibilities at the project site, potential hazards, and training level requirements. This is not intended to be a complete list of operational training requirements for all assigned personnel but lists the HAZWOPER access requirements for entry into the general operational areas. Where required, individual training plans that reflect required training for individual employees will be developed for project personnel that specify required qualification and certification requirements. Individual training plans are revised at least annually or as needed.

Personnel requiring project operation- or position-specific qualifications or certifications will complete the necessary training before beginning their project activities. As appropriate, a qualified instructor or subject matter expert will conduct the training and document it in accordance with companywide procedures, or formal on-the-job training will be conducted in accordance with MCP-61, "Conduct and Evaluation of on-the-Job Training."

Modifications (e.g., additions to or elimination of) to training requirements listed in Table 6-1 may be necessary based on changing field conditions. Any changes to the requirements listed in Table 6-1 must be approved by the HSO, with concurrence from the FTL, project manager, RCT, and IH, as applicable. These changes should be based on site-specific conditions and will generally be considered a minor change to the HASP, as defined by instructions from Form 412.11, "Document Management Control Systems (DMCS) Document Action Request (DAR)," because they are administrative in nature.

6.1 General Training

All project personnel are responsible for meeting training requirements including applicable refresher training. Evidence of training will be maintained at the project site, field administrative location, or electronically (e.g., Training Records and Information Network [TRAIN] [INEEL 2004c]). Nonfield team personnel and visitors must be able to provide evidence of meeting required training for the area of the site they wish to access before being allowed into a project area. As a minimum, all personnel who access project locations must receive a site-specific briefing, are required to wear PPE, and must provide objective evidence of having completed INL computer-based PPE training (00TRN288, "Personal Protective Equipment") or equivalent, in accordance with 29 CFR 1910.132, "Personal Protective Equipment."

Table 6-1. Required project-specific training.

	Minimum access requirements for specified positions	Project and Operational Areas to be Accessed (unless specific positions are listed, minimum access requirements apply to all other personnel and visitors)					
		Formal Project Work Zones				Controlled Project Areas (Prior to and/or After Posting of Formal Work Zones)	
Minimum Training Requirements[b]	FTL (or designate)[a], HSO[a], RadCon, and Samplers	Exclusion Zone	Contamination Reduction Corridor	Contamination Reduction Zone	Support Zone	Access to Soil Contamination Areas	Access to Non-Contamination Areas
40-hour hazardous waste operations (HAZWOPER)[c]	Yes	Yes	Yes[I]	Yes[I]		Yes[I]	
24-hour HAZWOPER[c]			Yes[J]	Yes[J]		Yes[J]	
Radworker II	Yes	Yes	Yes[I]	Yes[I]		Yes[I]	
Radworker I			Yes[J]	Yes[J]		Yes[J]	
GERT					Yes		Yes
Respirator training	d	d	d	d		d	
Project-specific health and safety plan training[e]	Yes	Yes	Yes	Yes		Yes	
Project-site orientation briefing[f]					Yes		Yes
Fire extinguisher training (or equivalent)	g	g	g	g	g	g	g
Cardiopulmonary resuscitation, medic first aid (CPR/first aid)	h	h	h	h	h	h	h

Table 6-1. (continued).

NOTE: Shaded fields indicate specific training is not required or applicable.

a. Will be trained to the HAZWOPER supervisor level.

b. Project operational support areas located within the TAN operations area may require additional training requirements such as INEEL access (Blue Card) or TAN access. Contact the TAN project shift supervisor for additional training requirements.

c. Includes 8-hour hazardous waste operations (HAZWOPER) refresher training as applicable, and supervised field experience as follows: 40-hour HAZWOPER = 24-hour supervised field experience and 24-hour HAZWOPER = 8-hour supervised field experience.

d. Only required if entering area requiring respiratory protection (e.g., action levels exceeded or the industrial hygienist sampling shows respirators required or as required by the RWP).

e. Includes project-specific hazards communications (29 CFR 1910.1200), site-access and security, decontamination and emergency response actions, as required by 29 CFR 1910.120(e), "Training."

f. Orientation includes briefing of site hazards, designated work areas, emergency response actions, and PPE requirements. Personnel receiving project-site orientation briefing only are limited to the areas outside controlled work areas and must be escorted by a project supervisor (FTL) or designee who is fully trained on the requirements of the HASP.

g. Due to the close proximity of the TAN Fire Department, the Fire Department will provide any fire suppression necessary while the field team is working.

h. At least one trained person onsite when field team is working. Due to the close proximity of emergency medical technicians at the TAN Fire Department, performance of first aid/CPR duties is not considered a designated duty (i.e., will be performed on a voluntary basis under the Good Samaritan Act).

i. Required if potential exposure exists for personnel accessing the specific work zone.

j. Required based on potential for exposure while observing work and not performing "work" as defined by OSHA Standards.

6.2 Project-Specific Training

Before beginning work at the project site, field team members will receive project-specific HASP training.(Training will consist of a complete review of (1) a controlled copy of the project HASP (via EDMS), attachments, and document action requests, (2) applicable job safety analyses (JSAs) and RWPs, (3) work orders, and (4) other applicable work control and work authorization documents. Project-specific training can be conducted in conjunction with, or separately from, the required formal prejob briefing (MCP-3003) and/or include electronic review of documents on EDMS.

Before Beginning work, personnel training records will be checked and verified to be current and complete for all the training requirements shown in Table 6-1. Following completion of site-specific training, personnel will sign Form 361.25, "Group Read and Sign Training Roster," or equivalent, indicating that they have (1) received this training, (2) understand the project tasks, associated hazards and mitigations, and (3) agree to follow all HASP and other applicable work control and safety requirements. Form 361.25 (or equivalent) training forms are available on the INL Intranet under "Forms."

A trained HAZWOPER 8-hour supervisor (FTL or other person who has been trained by the HAZWOPER supervisor) will monitor the performance of each newly 24-hour or 40-hour trained worker to meet the 1 or 3 days of supervised field experience, respectively, in accordance with 29 CFR 1910.120(e). Following the supervised field experience period, the supervisor will complete Form 361.47, "HAZWOPER Supervised Field Experience Verification," or equivalent, to document the supervised field experience.

NOTE 1: *Supervised field experience is only required if personnel have not previously completed this training at another CERCLA (42 USC 9601) site (documented), or they are upgrading from 24- to 40-hour HAZWOPER training. A copy of the training record must be kept at the project site as evidence of training or be available electronically in Training Records and Information Network (TRAIN).*

NOTE 2: *Completed supervised field experience training forms (Form 361.47, or equivalent) should be submitted to the project training coordinator for inclusion in the TRAIN.*

6.3 Prejob and Postjob Briefings and Safety Meetings

All project operational activities performed in accordance with companywide requirement documents will require a prejob briefing conducted by a qualified site supervisor. During this briefing, tasks associated with project tasks will be outlined, hazards identified, hazard controls and mitigation reviewed, PPE requirements discussed, waste minimization opportunities communicated, and employees' questions answered. Following the completion of operational activities, a post-job briefing will be conducted with particular emphasis of capturing lessons learned and process improvement for future operations.

Additionally, plan of the day (POD) safety meeting will be conducted to focus project personnel on the task being performed that day, which will include the identification of Human Performance Error Precursors and development of defenses in depth suitable to reduce/eliminate an error-likely event. Particular emphasis will be placed on lessons learned from the previous workday's activities and how tasks can be completed in the safest, most efficient manner. All personnel are encouraged to contribute ideas to enhance worker safety and mitigate potential exposures at the project sites. At the end of this meeting, any new work-control documents will be reviewed and signed (e.g., SWP, JSA, or RWP). This POD will be conducted as an informal meeting and the only required record will be to document

the completion of the POD in the FTL or construction engineer or subcontractor technical representative logbook.

NOTE: *If a formal MCP-3003 prejob briefing is conducted during the work shift, a POD is not required.*

Other safety meetings on various subjects will be conducted periodically for project personnel to reinforce specific safety topics. The FTL, assigned safety and health personnel or worker may conduct safety meeting. Attendance at the safety meetings will be documented on an applicable form and submitted to training personnel for entry into TRAIN.

7. SITE CONTROL AND SECURITY

Site control and security will be maintained at the project site during all activities to prevent unauthorized personnel from entering the work area. Entry into and exit out of these areas will be controlled through the appropriate use of barriers, signs, and other measures in accordance with PRD-5117, "Accident Prevention Signs, Tags, Barriers, and Color Codes."

The HSO and Safety Professional should be consulted regarding equipment layout at the project site to minimize personnel hazards from equipment. The focus should be on equipment with stored energy (electrical, pressurized systems, elevated materials/equipment, chemical), moving and rotating parts (equipment that is guarded and that has open rotating parts such as portable bandsaws), and other equipment with the potential to result in personnel injuries from being struck-by, caught-between, or entangled in such equipment. The layout at the project site of equipment should reflect the nature of the hazard presented and should be mitigated through the use of engineering controls (barriers, guards, isolation), administrative controls (roped off restricted areas or controlled entry access), and qualifications of operators and those assisting in the operation of the equipment, when required. Hazards will be routinely monitored throughout the work activity by radiological control, industrial hygiene, and/or safety professionals with resultant changes made to site controls or boundaries, and properly communicated to the site workers when deemed necessary.

Good housekeeping will be maintained at all times during the course of the project to include maintaining working and walking surfaces to minimize tripping hazards, stacking or storing materials and equipment in a centralized location when not in use, and regular cleanup of debris and trash that may accumulate at the project site.

Both radiological and nonradiological hazards (including industrial safety hazards) will be evaluated when establishing the initial work zone size, configuration, and location. Figure 7-1 illustrates an example of work zones that may be established at the project task site, based on HSO/RCT/IH recommendations. Figure 7-2 shows the work areas at the project site. Positioning of general work areas may change to accommodate other TAN operations (e.g., position of "Temporary Solidification Process Facility," "Crane Lift Pad," and so on). Common barriers may be used to delineate both radiological and nonradiological work-zone postings, depending on the nature and extent of contamination. If common barriers are used, they will be delineated and posted in accordance with both sets of requirements (29 CFR 1910.120 and 10 CFR 835), using appropriately colored rope and postings. These zones may change in size and location as project tasks evolve, based on project monitoring data, and as wind direction changes. Additionally, entrance and egress points will change based on these same factors. Controlled work zones may include:

- Designated work area (during mobilization, site setup, and final site restoration tasks)
- Contamination Reduction Zone (CRZ), Radiological Buffer Area (RBA), including a contamination reduction corridor (CRC)
- Exclusion Zone (EZ), Radiation Area (RA), High-Radiation Area (HRA), Contamination Area (CA), High-Contamination Area (HCA), or Very High-Radiation Area (VHRA).

Visitors may be admitted into work areas provided they (1) are on official business, (2) have received site-specific HASP training or orientation by the FTL or designee, (3) have met all the site-specific training requirements for the area they have a demonstrated need to access (including PPE training), as listed on Table 6-1, and (4) wear all required PPE.

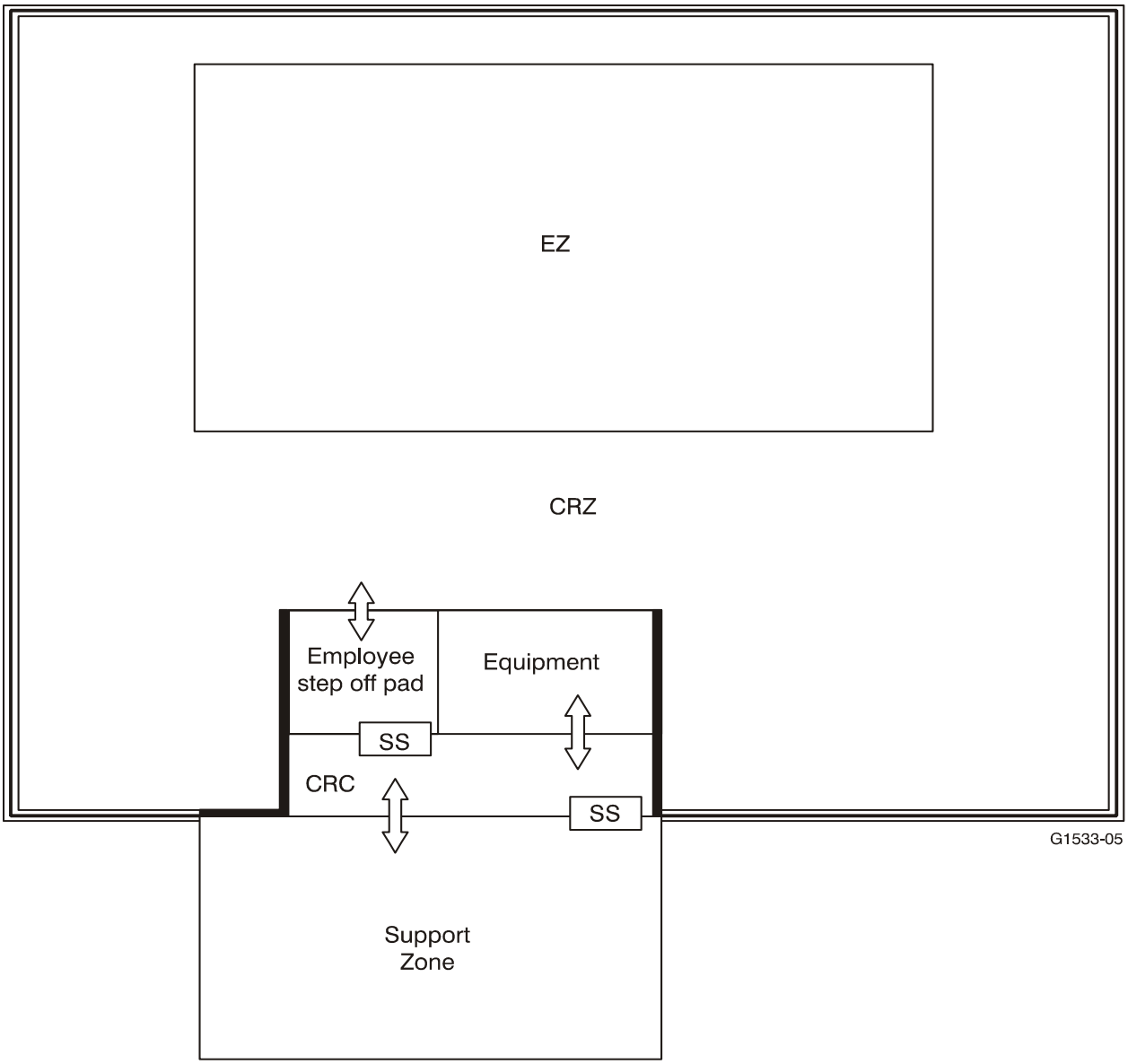


Figure 7-1. Work zone example.

NOTE: *Visitors may not be allowed into controlled work areas during certain tasks in order to minimize risks to workers and visitors. The determination as to any visitor's need for access into the controlled work area will be made by the FTL in consultation with the HSO and RadCon personnel.*

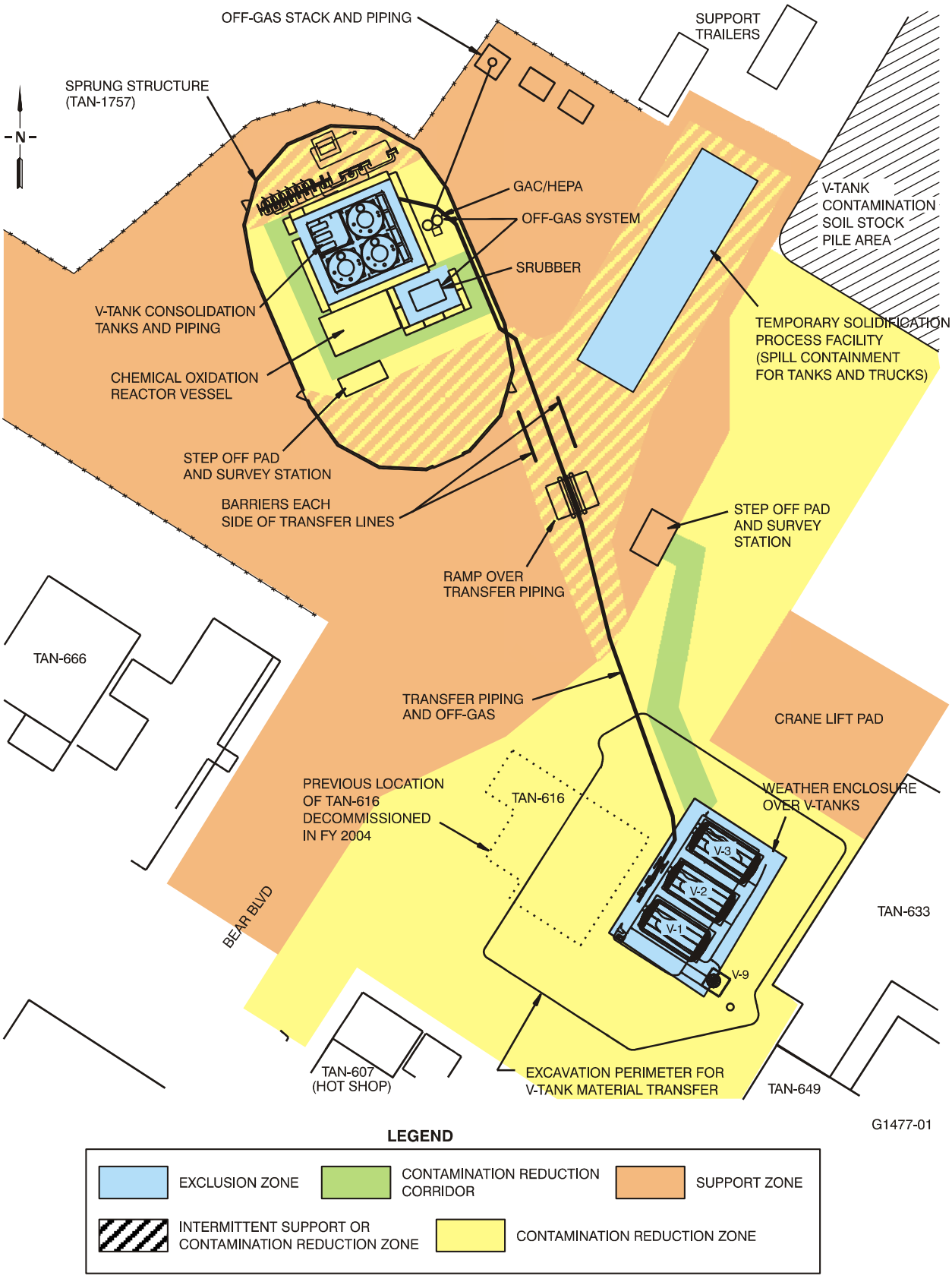


Figure 7-2. Excavation area.

7.1 Exclusion Zone

The exclusion zone (EZ) will be large enough to encompass the primary task area for work and to allow equipment and personnel to move about freely and conduct necessary tasks. The minimum number of personnel required to safely perform project tasks will be allowed into the EZ. If the EZ will be relocated to another site or reconfigured, it will be delineated in a configuration large enough to prevent nonfield team personnel in the support zone (SZ) from being exposed to potential safety and health hazards. The EZ shape and size will be based on the tasks being conducted, existing structures and facilities, and potential for impact to adjacent areas from project tasks or contaminants.

The EZ is a controlled access zone at all times. An entry and exit point will be established at the periphery of the EZ and the contamination reduction corridor (CRC) to regulate the flow of personnel and equipment. The EZ boundary will be delineated with rope or printed hazard ribbon and posted with signs in accordance with PRD-5117, "Accident Prevention Signs, Tags, Barriers, and Color Codes."

Factors that will be considered when establishing the EZ boundary include (1) tasks being conducted, (2) air monitoring data and prevailing wind direction, (3) radioactive contamination data, (4) radiation fields, (5) equipment in use, (6) the physical area necessary to conduct site operations, and (7) the potential for contaminants to be blown from the area. The boundary may be expanded or contracted as these factors change or additional monitoring information becomes available. All personnel who enter the EZ will wear the appropriate level of PPE for the hazards present and have required training as listed in Sections 5 and 6 of this HASP, respectively.

7.2 Contamination Reduction Zone and Corridor

The contamination reduction zone (CRZ) and the contamination reduction corridor (CRC) are transition areas surrounding the EZ and are located between the EZ and SZ. The CRC may not be formally delineated, but will be designated by the travel path from the established CRZ-controlled entry and exit point and the EZ entry and exit point. The CRZ and CRC will serve to buffer the SZ from potentially contaminated EZ areas. The CRZ and CRC may serve as staging areas for equipment and as temporary rest areas for personnel.

7.3 Support Zone

The support zone (SZ) will be considered a "clean" area. The location of the SZ will be in a prevailing upwind direction from the EZ (where possible) and readily accessible from the nearest road. The SZ is a designated area or building outside the CRZ and does not have to be delineated. Support trailers, vehicle parking, additional emergency equipment, extra PPE, and stored monitoring and sampling equipment may be located in the SZ. Visitors who do not have appropriate training to enter other project areas will be restricted to this zone.

7.4 Radiological Control and Release of Materials

Potential radioactively contaminated items or equipment will not be released until required radiological surveys have been completed (e.g., hand-held instruments and swipes) in accordance with MCP-139, "Radiological Surveys," MCP-425, "Radiological Release Surveys, and the Disposition of Contaminated Materials," as stated in the RWP, and as directed by RadCon personnel.

7.5 Site Security

All project site areas will be secured and controlled during normal work hours as described in the previous sections. During nonworking hours, the general project sites located inside INL facilities are controlled by the facility fence and normal security access requirements. However, additional project site security and control will be required to prevent unauthorized personnel from entering the project area and being exposed to potential safety or health hazards. This will be accomplished by delineating project areas with rope boundaries and posting where hazards are left unmitigated (e.g., open trenches, exposed contaminated soils, or equipment left onsite). Signage will be left in place during off hours and weekends to prevent personnel from inadvertently entering the area.

The FTL has the primary responsibility for ensuring that the project area is secured. The HSO and RadCon (where required) will ensure that all health and safety and radiological postings of the area are intact when leaving the site and will be responsible for maintaining them for the duration of the project. Project personnel are trained about site access and control requirements during project-specific HASP training and will not cross roped areas without the proper training and authorization, regardless of whether a sign is in place or not.

NOTE: *Signs are routinely lost because of high winds and will be replaced as soon as possible the next working day following discovery.*

7.6 Wash Facilities and Designated Eating Areas

Project activities such as excavation, SSA operations, waste, tank and piping removal, decontamination, and sampling that will involve close contact with waste and other potentially contaminated surfaces. Personnel will obey all radiological survey requirements to prevent inadvertent uptakes of radiological or chemical contaminants. Ingestion of hazardous substances is more likely when workers do not practice good personal hygiene habits during and following activities in the operations areas of the project. It is important to wash hands, face, and other exposed skin areas thoroughly after completion of work and before smoking, eating, drinking, or chewing gum or tobacco.

Sanitation and shower facilities will be available for project personnel within TAN facility areas.

The designated eating areas for project personnel will be established in TAN-607 or alternate designated eating areas.

NOTE: *No smoking, chewing, eating, applying lip balm or sun screen, or drinking is allowed within CERCLA-regulated areas and radiologically controlled areas.*

7.7 Designated Smoking Area

Smoking will only be permitted in designated smoking areas outside the project CERCLA regulated and radiologically controlled areas. Personnel will comply with all INL smoking polices, including disposal of smoking materials in the proper receptacles. Smoking will not be permitted outside facilities without establishing a designated smoking area. All GDE-7063, “INL Wildland Fire Management Guide,” requirements related to smoking at the INL will be practiced.

8. OCCUPATIONAL MEDICAL SURVEILLANCE

Task-site personnel will participate in the INL Occupational Medical Program (OMP), defined in Program Description Document (PDD) -61, "Occupational Health Program," to implement the requirements of DOE Order 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees"; and 29 CFR 1910.120(f). Medical surveillance examinations will be provided before assignment, annually, and after termination of HAZWOPER duties or employment. This includes:

- Personnel who are, or may be, exposed to hazardous substances at or above the OSHA permissible exposure limit (PEL), or published exposure limits, without regard to respirator use for 30 or more days per year
- All employees who are injured, become ill, or develop signs or symptoms because of possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation
- All employees who wear a respirator for 30 days or more a year or as required by "Respiratory Protection (29 CFR 1910.134)."

Additionally, personnel exposed to OSHA-regulated substances above the established action levels will receive the associated medical surveillance.

Personnel who wear a respirator in performance of their job, or who are required to take respirator training to perform their duties under this plan, must participate in the medical evaluation program for respirator use at least annually, as required by MCP-2726, "Respiratory Protection."

If the OMP does not have sufficient information to complete a medical evaluation before respirator training, the employee's supervisor will be notified. The employee will not be permitted to fit test until the needed information is provided and any additional examination or testing is completed.

A single copy of the V-Tanks project HASP, job hazard analysis requirements, required PPE, and other exposure-related information will be made available, upon request, to the INL OMP physician (and subcontractor physicians where they are assigned to the project) conducting medical surveillance for employees participating in project operations. Exposure monitoring results and hazard information furnished to the OMP physician will be supplemented or updated annually if required (as stated in Section 12) as long as the employee is required to maintain a hazardous waste and material employee medical clearance. The OMP physician will then evaluate the physical ability of an employee to perform the work assigned.

The OMP physician shall evaluate the physical ability of project personnel to perform the work assigned, as identified in this HASP, other project facility-related documentation, and individual training plans. A documented medical clearance (e.g., a physician's written opinion) will be provided to the employee and supervisor stating whether the employee has any detected medical condition that would place him or her at increased risk of health impairment from project operations, emergency response operations, respirator use, and radiological work, as applicable. The OMP responsibilities, with regard to personnel assigned to project operations include, but are not limited to, the following:

- Providing current comprehensive medical examinations (as determined by the examining physician) at an INL medical facility for full-time project personnel
- Obtaining records or reports from an employee's private physicians, as required by the OMP director

- Performing a medical evaluation on return-to-work cases following an absence in excess of 1 work-week (40 consecutive work hours) resulting from illness or injury
- Conducting a medical evaluation in the event that management questions the ability of an employee to work or if an employee questions his or her own ability to work.

Personnel are responsible for communicating any work or medical restrictions to their supervisor so modified work assignments can be made if necessary. During the MCP-3003 prejob briefing, the supervisor conducting the briefing should ask workers if they have any work restrictions. However, it is the responsibility of each employee to inform the supervisor of any work or medical restrictions.

NOTE: *All managers, supervisors and foreman have access to employees' current medical restrictions, certifications and surveillances through the OMP database on the Safety and Health homepage or OMP reports link: http://webhome4/OMPReports/. This allows management to review medical restrictions, surveillances, and certifications before assigning work tasks to employees.*

8.1 Subcontractor Workers

If subcontractors participate in project activities or may be exposed to project hazardous substances or health hazards at or above the established permissible exposure limit for these substances without regard to the use of respirators for 30 days or more a year, they shall participate in a subcontractor medical surveillance program that satisfies the requirements of 29 CFR 1910.120(f). The physician's written opinion will serve as documentation that subcontractor personnel are fit for duty.

8.2 Injuries and Illness on the Site

Medical data from the subcontractor employee's private physician, collected pursuant to hazardous material worker qualification, shall be made available to the INL OMP physicians, upon request. A subcontractor employee's past radiation exposure history may be requested and, if so, will be submitted to the INL radiation dosimetry and records section, in accordance with MCP-188, "Issuing Thermoluminescent Dosimeters and Obtaining Personnel Dose History," and MCP-2381, "Personnel Exposure Questionnaire," of the INL Radiation Protection Manual.

It is the policy of the INL that an INL OMP physician examine all injured personnel for the following reasons:

- An employee is injured on the job
- An employee is experiencing signs and symptoms consistent with exposure to a hazardous material
- An employee is believed to have been exposed to toxic substances or physical or radiological agents in excess of allowable limits during the course of a project at the INL.

NOTE: *In the event of an illness or injury, the decision to provide first aid and transport to the nearest medical facility, or whether to immediately request an ambulance and continue to stabilize and provide first aid, should be based on the nature of the injury or illness and the likelihood that transporting the individual may cause further injury or harm. Most likely, the person making this decision will only be trained to the medic first/CPR level and should contact the Test Area North (TAN) medical facility at 777 or 526-6263, or the Central Facilities Area (CFA) medical facility (777 or 526-1515), for further guidance if there is any question as to the extent of injury or potential to cause further harm by movement of the injured individual.*

In the event of a known or suspected injury or illness caused by exposure to a hazardous substance or physical or radiological agent, the employee will be transported to the nearest INL medical facility for evaluation and treatment. The shift supervisor is responsible for obtaining as much of the following information as is available to accompany the individual to the medical facility:

- Name, job title, work location, and supervisor's name and phone number
- Substance, physical or radiological agent exposed to (known or suspected), and material safety data sheet, if available
- Nature of the incident and injury or exposure and associated signs or symptoms of exposure
- First aid or other measures taken
- Locations, dates, and results of any relevant personal or area exposure monitoring or sampling
- List of PPE worn during this work (e.g., type of respirator and cartridge used).

Further medical evaluation will be determined by the treating or examining physician in accordance with the signs and symptoms observed, hazard involved, exposure level, and specific medical surveillance requirements established by the OMP director in compliance with 29 CFR 1910.120.

NOTE: *In the event of an illness or injury to a subcontractor employees, they will be taken to the closest INL medical facility (CFA-1612) (unless doing so will not cause further injury or harm) or be transported by INL ambulance to have an injury stabilized before transport to the subcontractor's treating physician or offsite medical facility.*

The TAN shift supervisor will be contacted if any injury or illness occurs within project operational areas. As soon as possible after an injured employee has been transported to the INL medical facility, the shift supervisor or designee will make additional notifications listed in Section 10.

Radiological Control personnel will evaluate all actual and suspected radiological exposures in excess of allowable limits and will establish follow-up actions. For internal uptakes (as calculated committed effective dose equivalent values), an the "Established Levels of Radionuclide Intake for Consideration of Medical Intervention" (EDF-INEL-003) will be used as the basis for this evaluation and follow-up actions. All wounds will be examined by an OMP physician to determine the nature and extent of the injury. The RadCon supervisor in conjunction with an OMP physician will determine whether the wound can be bandaged adequately for entry into a radiological contamination area in accordance with Article 542 of the Radiological Control Manual (RCM) (PRD-183).

8.3 OSHA Substance-Specific Standards

Project operations will involve potential exposure to waste contaminated with radiological and chemical constituents (see Tables 2-1). Several V-tank waste and miscellaneous waste to be returned have constituents that are regulated under OSHA substance-specific standards. These substances are listed below:

- Vinyl Chloride (29 CFR 1910.1017)
- Inorganic Arsenic (29 CFR 1910.1018)
- Lead (29 CFR 1910.1025)

- Cadmium (29 CFR 1910.1027)
- Benzene (29 CFR 1910.1028)
- Methylene Chloride (29 CFR 1910.1052).

These substance standards govern the manner that initial personnel sampling and medical surveillance is conducted based on exposure action levels that trigger medical surveillance and other compliance (i.e., written compliance programs, periodic sampling, regulated areas, etc.) requirements. Based on the V-Tanks project safety design features and engineering controls (e.g., confinement, barriers, and negatively pressured HEPA-filtered off-gas systems) for control of radiological constituents, exposure levels for work around the V-Tanks, piping systems, and related consolidation tanks are not anticipated to reach the defined action levels. Additionally, wetting and misting during excavation tasks will be employed to minimize particulate generation, thus further reducing the potential for exposures.

Formal exposure assessment conducted by the project IH in accordance with MCP-153, "Industrial Hygiene Exposure Assessment" will provide the determination as to the applicability of the aforementioned OSHA substance standards. The off-gas system will not employ S-GAC units to capture VOC emissions, so the project IH will conduct monitoring, as defined in the operating procedures, to ensure personnel exposure levels remain below action levels. The IH will immediately institute the defined action(s) if action levels are reached in work zone(s) where personnel are present or exposure is anticipated. New sites remediation areas will require only minimal direct contact with potentially contaminated soils, therefore, the action levels associated with these substance-specific standards are not anticipated to be exceeded.

The IH and RadCon personnel will conduct exposure assessments for each activity to determine the potential for exceeding OSHA substance standard action levels. The regulatory requirements for each OSHA substance-specific standard will be reviewed against exposure monitoring data (where available) and in the context of the exposure potential using professional judgment. If project activities involving chemicals listed in 29 CFR 1910.1003, "13 Carcinogens," MCP-2703, "Carcinogens," will be followed.

All exposures to ionizing radiation will be evaluated in accordance with the RCM and, where deemed appropriate, be controlled through the use of an RWP in accordance with MCP-7, "Radiological Work Permit."

If new project waste forms or streams are identified or operational chemicals are introduced during the course of operations, then exposures will be evaluated and quantified to determine if a substance-specific standard applies. If regulatory mandated substance-specific standard action levels are triggered, then affected personnel will be enrolled in applicable substance-specific medical surveillance programs.

9. PROJECT ORGANIZATION AND RESPONSIBILITIES

The Waste Area Group 1, Operable Unit 1-10 V-Tank and New Sites CERCLA field activities addressed in this document are being implemented at TAN, by the TAN D&D Organization, for the Miscellaneous Sites Cleanup Project. The Interface Agreement (IAG-366), "Interface Agreement Between Miscellaneous Sites and D&D for the V-Tanks Remediation Project," defines the roles, responsibilities, approvals, and authorities between the Miscellaneous Sites Cleanup Project (MSCP) and the Test Area North (TAN) D&D for the V-Tanks Remediation Project. This agreement clearly defines responsibilities, controls, and boundaries necessary for safe and efficient operations and maintenance associated with the V-Tank Remediation Project.

9.1 Field Team Leader

The FTL has ultimate responsibility for the safe and successful completion of the sampling project. All health and safety issues at the work site must be brought to the FTL's attention. In addition to managing fieldwork, executing the field sampling plan, enforcing site control, documenting work site activities, and conducting daily safety briefings, FTL responsibilities include, but are not limited to, the following:

- Interfacing with the facility manager and facility personnel, including scheduling work on the facility plan of the week and making notifications
- Complying with the technical and operational requirements of the sampling activities
- Conducting field analyses and decontamination activities
- Complying with equipment removal procedures
- Packaging and shipping samples
- Determining, in conjunction with the site IH and RCT, the level of PPE necessary for the task
- Ensuring compliance with field documentation, sampling methods, and chain-of-custody requirements
- Ensuring the safety of personnel conducting the activities associated with the field sampling plan.

The FTL will serve as the sampling team leader. The FTL's responsibilities may be transferred to a designated representative who satisfies all FTL training requirements. An FTL must be present at all times when anyone is inside the designated work areas. If the FTL must leave, an alternate must be appointed and documented in the FTL logbook including name, verification of training requirements, and time of turnover.

9.2 Field Team Personnel

All field team personnel, including facility and subcontractor support personnel assigned to the project, will understand and comply with the requirements of this HASP. The FTL (or designee) may

conduct a formal prejob briefing or POD meeting at the start of each shift. During the POD briefing, all daily tasks, associated hazards, hazard mitigation (e.g., engineering and administrative controls, required PPE, and work control documents), and emergency conditions and actions will be discussed. Input from the project HSO, IH, and safety personnel (where assigned) will be provided to clarify task health and safety requirements (as deemed appropriate). All project personnel are encouraged to ask questions about site tasks and provide suggestions on ways to perform required tasks in a more safe and effective manner based on the lessons learned from previous routine monitoring activities.

Once at the project site, field team personnel are responsible for identifying any potentially unsafe situations or conditions to the FTL or HSO for corrective action.

NOTE: *If it is perceived that an unsafe condition poses an imminent danger, site personnel are authorized to stop work immediately and notify the FTL or HSO of the unsafe condition.*

9.3 Nonfield Team Personnel

As defined by this HASP, all persons who may be at a project site and are not part of the field team (e.g., surveyors or others not assigned a field team support role) are considered nonfield team personnel. A person will be considered onsite when they are present beyond the SZ boundary.

Nonfield team personnel are considered occasional site workers in accordance with HAZWOPER and must receive site-specific HASP training before entering work areas at the project site unless there is no potential for exposure and safety hazards are mitigated (e.g., during down time). In such a case, a site orientation briefing covering potential safety and health hazards, required PPE, and emergency actions is required before being granted access to the area. A site supervisor (e.g., HSO or FTL) will supervise nonfield team personnel who have not completed their 3 days of supervised field experience in accordance with HAZWOPER.

9.4 Visitors

All visitors with official business at the project site (including INL/ICP personnel, representatives of DOE, and state or federal regulatory agencies) may only proceed beyond the SZ after meeting the following requirements:

- Receiving site-specific HASP training or hazard briefing based on specific tasks taking place
- Signing a HASP training roster and providing proof of having met all training requirements specified in Section 6 (or required access training for the area to be visited when project tasks are not being conducted)
- Participating in a prejob briefing in accordance with MCP-3003
- Providing objective evidence of PPE training and wearing the appropriate PPE for the area of the site to be accessed (29 CFR 1910.132).

If there is no potential for exposure to chemical, radiological, or safety hazards (e.g., during down time), a visitor may be escorted at the project site after receiving a site orientation consisting of:

- An overview of the controlled areas at the site and access restrictions
- Potential general site hazards and mitigation
- Required PPE for entry to the site (must be trained to wear required PPE)

- Emergency action to take in case of a take-cover or evacuation alarm.

NOTE: *Visitors will not be allowed into controlled work areas (even with proper training) during certain tasks to minimize risks to visitors. The FTL in consultation with the HSO, safety professional, and RCT (as appropriate) will determine any visitor's need for access into the controlled work areas during such tasks.*

A fully trained task-site representative (e.g., FTL or HSO [or a designated alternate]) will escort visitors when entering controlled areas of the project site, as site conditions warrant and as deemed appropriate by the FTL.

A casual visitor to the task site is a person who does not have a specific task to perform or other official business to conduct at the project site. Casual visitors are not permitted in work zones or designated work areas at any project site.

9.5 Radiological Engineer

The radiological engineer is the primary source of information and guidance relative to evaluation and control of radioactive hazards at the project. The radiological engineer will provide engineering design criteria, review containment structures, and make recommendations to minimize health and safety risks to project personnel. The radiological engineer will estimate radiation exposure and provide as-low-as reasonably achievable evaluations, identify the type(s) of radiological monitoring equipment necessary for the work, advise the FCC/FTL and RCT of changes in monitoring or PPE, and advise personnel on project evacuation and reentry. The radiological engineer may have other duties, as specified in other sections of this HASP or in *Manual 15B–Radiation Protection Procedures*.

9.6 Health and Safety Officer

The HSO is the person assigned to the task site who serves as the primary contact for all health and safety issues. The HSO advises the FTL on all aspects of health and safety and is authorized to stop work at the task site if any operation threatens worker or public health or safety. The HSO is authorized to verify compliance to the HASP, conduct inspections and self-assessments, require and monitor corrective actions, and monitor decontamination procedures (as appropriate). The safety, health, and quality assurance (SH&QA) professionals at the task site (e.g., safety professional, IH, environmental coordinator, and facility representative) support the HSO.

Persons assigned as the HSO or alternate HSO must be qualified (in accordance with the definition in 29 CFR 1910.120) to recognize and evaluate hazards and will be given the authority to take or direct actions to ensure that workers are protected. While the HSO may also be the IH, safety professional, or in some cases the FTL (depending on the hazards and complexity of the activity involved), other task-site responsibilities of the HSO must not interfere with the primary role of the HSO at the task site.

If it is necessary for the HSO to leave TAN, the HSO will appoint an alternate individual to fulfill this role and that person's identity will be communicated to project personnel.

9.7 Industrial Hygienist

The assigned IH is the primary source for information regarding exposure assessments for the project's chemical, physical, and biological hazards at the task site. The IH assesses the potential for worker exposures to hazardous agents in accordance with companywide safety and health manuals,

MCPs, and industry-accepted industrial hygiene practices and protocol. By participating in project planning, the IH assesses and recommends appropriate hazard controls for the protection of site personnel, operates and maintains airborne sampling and monitoring equipment, reviews engineering controls for effectiveness, and recommends and assesses the use of PPE required in this HASP (recommending changes as appropriate).

Personnel showing health effects (i.e., signs and symptoms) resulting from possible exposure to hazardous agents will be referred to an OMP physician by the IH, supervisor, or HSO. The IH may have other duties at the site, as specified in other sections of this HASP or in PRDs or MCPs.

9.8 Safety Professional

The assigned safety professional reviews work packages, observes site activity, assesses compliance with the companywide safety and health manuals, advises the FTL on required safety equipment, and recommends solutions to safety issues and concerns that arise at the task site. The safety professional may conduct periodic inspections in accordance with MCP-3449 and have other duties at the task site, as specified in other sections of this HASP or in PRDs and MCPs. Copies of any safety and health inspections will be kept in the project field file.

9.9 Radiological Control Technician

The assigned RCT is the primary source for information and guidance on radiological hazards that may be encountered during project tasks and the controls necessary to mitigate them. Responsibilities of the RCT include the following:

- Performing radiological surveying of the site, equipment, and samples
- Providing guidance for radioactive decontamination of equipment and personnel
- Accompanying the affected personnel to the nearest INL/ICP medical facility for evaluation if significant radionuclide contamination occurs.

The RCT must notify the FTL and HSO of any radiological occurrence, which must be reported as directed by LRD-15001, “Radiological Control Manual.”

10. EMERGENCY RESPONSE PLAN

This emergency response plan defines the roles and responsibilities of project personnel during an emergency. Such an emergency could be at the project site, on a tenant facility or collocated facility, or a Sitewide emergency. This section provides details of the INL Emergency Response Organization (ERO) and "INL Emergency Plan RCRA Contingency Plan" (PLN-114) information. PLN-114 describes the overall process developed to respond to and mitigate consequences of emergencies that might arise at the INL.

PLN-114 may be activated in response to events occurring at the project site, at the INL, or at the discretion of the emergency coordinator or emergency action manager. Once the INL plan is activated, project personnel will follow the direction and guidance communicated by the emergency coordinator.

NOTE: *The OSHA HAZWOPER definition of an emergency is not defined the same as classified by DOE Orders 151.1B, "Comprehensive Emergency Management System," and 231.1A, "Occurrence Reporting and Processing of Operations Information." For this reason, the term "event" will be used in this section when referring to project HAZWOPER emergencies.*

10.1 Emergency Planning

The INL Emergency Plan RCRA Contingency Plan provides the basis for preplanning all INL emergency events. This base plan is supplemented with INL facility-specific addendums. This preplanning makes it possible for the project to anticipate and appropriately respond to abnormal events that can affect operational activities. Preplanning also ensures that this project operations emergency response plan is integrated with the INL and TAN emergency response programs. Specific procedures for addressing emergency events and actions to be taken are further described in the facility-specific emergency implementing procedures. Emergency action levels have been established for the V-tanks remediation and consolidation project. These emergency action levels are posted in the TAN emergency control center (SMC cafeteria). Finally, this HASP addresses operational-specific hazards, potential emergency events, and the protective actions to take following such events. Emergency response program planning elements that must be completed before the initiation of project operations include the following:

- Establishing emergency warning signals and evacuation routes
- Establishing effective site communications
- Establishing requirements for emergency equipment and supplies
- Implementing personnel accountability procedures
- Identifying an adequate number of CPR and medic first-aid trained personnel
- Establishing the preferred means for notifying the INL ERO of abnormal events.

NOTE: *All project emergencies will be reported through the TAN shift supervisor to the ERO for classification in accordance with Section 4 of PLN-114. If the TAN ERO is activated, site emergency response will follow PLN-114, TAN Addendum 4 (PLN-114-4).*

10.2 Emergency Preparation and Recognition

The HASP Sections for hazards identification and mitigation (Section 2) and accident prevention (Section 4) provided the strategy that will be followed at the project site and TAN-607 operational areas to prevent accidents. Similarly, emergency preparation and recognition also will require project personnel to be constantly alert for potentially hazardous situations and signs and symptoms of chemical exposure or releases. All project personnel should be familiar with the techniques for hazard recognition and the associated response including proper operational notifications. Emergency phone numbers and evacuation route maps will be located throughout project operational areas.

Preparation and training on emergencies will include proper project access and egress procedures in response to project operational events and INL emergencies as part of the HASP training and project operations area access training where applicable. Visitors also will receive a briefing on emergency procedures during the hazard and general operations orientation briefing (see Table 6-1) and potentially complete HASP training depending on the project operations area to be accessed. Visitor emergency actions briefing will include, alarm identification, location and use of communication equipment, location of Site emergency equipment, and evacuation.

On-scene response to and mitigation of operational emergencies could require the expertise of INL fire department and medical personnel. Emergencies that could occur include the following:

- Accidents resulting in injury
- Fires
- Spills of hazardous or radiological materials
- Tornadoes, earthquakes, and other adverse natural phenomena
- Vehicle or transportation emergencies
- Safeguard and security emergencies
- Emergencies at nearby facilities that could prompt evacuation or take-cover actions at the task site
- Emergency facilities and equipment.

Emergency response equipment, including the items described in Table 10-1, will be maintained within the project area. The TAN PLN-114 Addendum 4 (PLN-114-4) lists emergency equipment available at TAN. This includes the emergency coordinator located in TAN-607 and equipment located in TAN-607. Additional heavy construction and other equipment listed in PLN-114-4 is available for use during emergencies.

The INL fire department maintains an emergency HAZMAT response van that can be used to respond to an event or emergency within the project operations areas. Fire department personnel are also trained to provide immediate hazardous material spills and medical services. Additionally, the CFA-1612 medical facility is manned by medical personnel to evaluate and stabilize injured personnel or those experiencing signs and symptoms of exposure. At least one individual with current medic and first-aid training will be present within the project area during active operations.

Table 10-1. Emergency response equipment to be maintained at the project site during operations.

Equipment Name and Quantity Required	Location at the Project Site	Responsible Person	Frequency of Inspection
Fire extinguishers[a]	Located throughout the operations area, at the controlled work area boundary, and on each piece of industrial and heavy equipment	HSO	Monthly
Eye wash station[b]	At the controlled work area boundary for the Project area	HSO	Monthly or the frequency determined by the manufacturer
Eye wash bottle[c]	At the SSA/Project Areas	HSO	Monthly or replace after use
Hazardous materials spill kit	At the controlled area boundary	HSO	Monthly
Communication equipment available	In all operational areas or in possession of key project personnel	FTL	Availability and daily functional check

a. 10A/60BC extinguishers or as specified by the TAN fire protection engineer. 5A/10BC for vehicles.

b. Portable eye wash stations that meet the ANSI Z358.1-2004 requirement.

c. An eye wash bottle will be used to provide an immediate eye flush if required. Portable eye wash stations that meet the ANSI Z358.1-2004 requirement are available at V-Tanks area.

HSO = health and safety officer SSA = soil storage area

10.3 Emergency Communications

In the event of an emergency, capability to perform the following actions is required:

- Summon INL emergency response resources
- Immediately notify project personnel
- Inform others of the emergency.

Communications equipment within the V-Tanks remedial actions project areas will include a combination of radios, telephones (i.e., mobile, cellular, or landline), and pagers. The TAN shift supervisor will be notified of any project emergency event and the shift supervisor will then make the required INL ERO notifications.

10.3.1 Notifications

During emergency situations, the TAN shift supervisor will be notified of any operational emergency event. The shift supervisor will then notify the required ERO and Warning Communications Center (WCC) notifications. The following information should be communicated, as available, to the TAN shift supervisor:

- The caller's name, title (e.g., FTL), telephone number, and pager number
- Exact location of the emergency

- Nature of the emergency including time of occurrence, current site conditions, and special hazards in the area
- Injuries, if any, including numbers of injured, types of injuries, and conditions of the injured personnel
- Emergency response resources required (e.g., fire, hazardous material, and ambulance)
- Additional information as requested.

NOTE: *If the TAN shift supervisor cannot be contacted, then the WCC will be notified of the emergency event and the information listed above will be communicated. The WCC also must be told that notification to the TAN shift supervisor and emergency coordinator has not been made.*

10.4 Personnel Roles, Lines of Authority, and Training

10.4.1 Idaho National Engineering and Environmental Laboratory Emergency Response Organization

The INL ERO structures are based on the incident command system and are described in PLN-114 and facility-specific addenda to that plan.

10.4.2 Role of Project Personnel in Emergencies

Depending on the event, a graded response and subsequent notifications will take place. The FTL and project personnel responsibilities are described below. Project personnel will respond to emergencies only within the limits of their training and designated by their position. All personnel are trained to the HASP and TAN-specific emergency actions as part of the access training or will be escorted by someone who has been trained. Emergency response actions also will be covered as part of the HASP briefing.

10.4.2.1 Field Team Leader. The project FTL is responsible for initiating all requests for emergency services (e.g., fire and medical) and for notifying the TAN shift supervisor of abnormal or potential abnormal events occurring within the project operations area. In addition, the shift supervisor or trained alternate will serve as the area warden. The area warden is responsible for conducting personnel accountability for all operations areas. This will be accomplished by completing positive sweeps of all project areas to ensure personnel are aware of the emergency event. Following notification of the emergency event, project personnel will be directed to the designated assembly point where the attendance log (or equivalent) will be used to determine what personnel are onsite (role call). The FTL then will report accountability status to the TAN shift supervisor, who will in turn, initiate communicate this information to the TAN emergency coordinator.

Additionally, the FTL will control the scene of any emergency event (from a safe distance) until a member of the Incident Command System authority arrives at the scene to take control as the on-scene commander (OSC). When communicating emergency information to the OSC, the FTL will provide all requested information about the nature of the event, potential hazards, and other information requested by the OSC.

10.4.2.2 Project Assigned Field Personnel. Every person within the project area during an emergency event or INL emergency has a role to play. Personnel must be constantly aware of potential problems or unexpected hazardous situations and immediately report these situations to the FTL. All personnel are expected to assist with accountability when required, to report near misses and emergency events of concern to the FTL, and to respond to emergency events, as provided for in this HASP. Specific facility personnel responsibilities are outlined in Table 10-2.

Table 10-2. Responsibilities during an emergency.

Responsible Person	Action Assigned
Any project worker	Contact the FTL with information regarding an emergency event
Any fire-extinguisher-trained worker	Extinguish fires in incipient stages only or contain spills (within level of training). If area is evacuated, only fire department trained personnel may re-enter to extinguish fire.
Any medic first aid and CPR-trained personnel	Provide first aid within level of training (on a voluntary basis)
FTL or designee	Contact the TAN shift supervisor or emergency coordinator (if emergency coordinator has formed)
FTL or designee	Contact the INL site emergency telephone number or the WCC (if TAN shift supervisor cannot be contacted)
FTL or trained designee	Conduct personnel accountability and report information to the TAN shift supervisor or emergency coordinator
FTL or designee	Report incipient fires to the INL fire department Report spills to the INL spill notification team
FTL	Report occupational injuries or illnesses to the TAN Fire Department and INL OMP

CPR = cardiopulmonary resuscitation
FTL = field team leader
INL = Idaho National Laboratory
OMP = Occupational Medical Program
TAN = Test Area North
WCC = Warning Communications Center

10.4.2.3 Personnel Accountability and Area Warden. Project personnel are required to TAKE COVER within the project area or may be required to evacuate the project area or TAN in response to an EVACUATION. In each case, the FTL or trained alternate shall account for the people present within the project area. The FTL or trained alternate will serve as the area warden and complete the personnel accountability (following positive sweeps of V-Tanks project areas). The results of this accountability will then be reported to the TAN shift supervisor or emergency coordinator (if the emergency coordinator has been formed).

10.4.2.4 Fire. If fire, smoke, or the smell of combustion is detected, project personnel shall immediately notify the INL Fire Department. Notification should be by the nearest pull station, if available, followed by calling one of the emergency phone numbers to describe the location and description of the event in addition to the name of the caller, the building or project number and location and other pertinent information available including wind direction. If a fire is detected in the incipient stage, trained fire extinguisher users may choose to attempt the extinguishment of the fire following emergency notification on their way out of the affected area. No personnel shall re-enter a building or structure to extinguish a fire once the area, building, or structure has been evacuated.

10.4.2.5 Spills. If the material spilled is known and is small enough to be safely contained, project personnel will handle spill control within their level of training (as described below) using spill supplies in the project operational area. The spill will be immediately reported to the FTL or TAN shift supervisor (if the FTL cannot be contacted). Reporting requirements will be determined by the TAN emergency coordinator in accordance with MCP-190, "Event Investigation and Occurrence Reporting." If any release of a hazardous material occurs, task site personnel will comply with the following immediate spill response actions.

10.4.2.5.1 Untrained Initial Responder—The requirements for the untrained initial responder (or if the material characteristics are unknown) are listed below:

- Place equipment in a safe configuration (as applicable)
- Evacuate and isolate the immediate area
- Notify and then seek help and warn others in the area
- Notify the FTL.
- Do not re-enter evacuated areas.

10.4.2.5.2 Trained Responder—The requirements for the trained responder where material characteristics are known and no additional PPE is required are listed below:

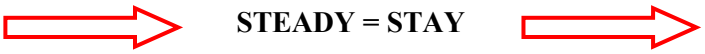
- Place all equipment in a secure configuration (as applicable)
- Seek help and warn others in the area
- Stop the spill if it can be done without risk (e.g., returning the container to the upright position, closing valve, and shutting off power)
- Provide pertinent information to the FTL
- Secure any release paths if safe to do so.

10.5 Emergency Alerting, Responses, and Sheltering

10.5.1 Alarms

Alarms and signals are used at the project site and the INL to notify personnel of abnormal conditions requiring a specific response. These include radiation-monitoring alarms denoted by fast ringing bells and fire alarms that may vary from building to building within the TAN and project areas. Responses to these alarms are addressed in the general employee and site-access training for environment, safety, and health employees. In addition to these alarms, emergency sirens located throughout the TAN serve as the primary means for signaling emergency TAKE COVER or EVACUATION protective actions.

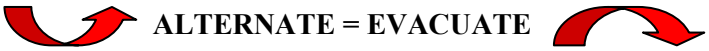
10.5.1.1 Take Cover. Continuous Siren. Radiation or hazardous material releases, adverse weather conditions, or other event or emergency conditions may require that all personnel take cover indoors in the nearest building. A TAKE COVER protective action may be initiated as part of a broader response to an emergency situation and may precede an evacuation order. The order to TAKE COVER is usually announced by activating the emergency siren. The signal to take cover is a CONTINUOUS SIREN. The order to TAKE COVER is usually announced by activating the TAN emergency siren.



TAKE COVER also can be given by word of mouth, radio, or voice paging system. When ordered to TAKE COVER, project personnel will place project operations equipment in a safe configuration (as applicable) and then seek shelter in project operations or administrative buildings (if outdoors). Eating, drinking, and smoking are not permitted during take-cover conditions.

RadCon personnel will assist and direct all workers exiting from radiological contamination areas during a TAKE COVER alarm.

10.5.1.2 Total Area Evacuation. Alternating Siren. A total area evacuation is the complete withdrawal of personnel from the entire project operations and TAN area. The evacuation signal is an ALTERNATING SIREN.



When ordered to EVACUATE, project personnel will place project operations equipment in a safe configuration (as applicable) and then proceed along the specified evacuation route to the designated assembly area or as directed by the emergency coordinator. For total area evacuations, the TAN command post is activated and all personnel will gather at the primary TAN evacuation assembly area or the location designated by the emergency coordinator. The shift supervisor or trained alternate will then complete the personnel accountability and report the result of the accountability process to the TAN emergency coordinator. Radiological Control personnel will assist and direct all workers exiting from radionuclide-contamination areas during an EVACUATION alarm. Eating, drinking, and smoking are not permitted during emergency evacuations.

10.5.1.3 Local Area (Project Area) Evacuation. A local area evacuation is the complete withdrawal of personnel from a portion of or all V-Tanks project areas, but it does not necessarily require the complete evacuation of the entire TAN. An example would be if a CAM alarmed within the V-Tanks excavation area. This alarm will serve as the primary emergency evacuation signal for personnel in the V-Tanks area. The order to evacuate project areas can also be given by word of mouth, radio, or voice paging system. When ordered to evacuate the project operational area, personnel shall place the project equipment in a safe condition (as applicable) and then proceed along the specified evacuation route to the assembly area designated for local area evacuations, or as directed by the FTL. (Emergency evacuation routes for TAN-607 are posted in the facility). The FTL will then conduct personnel accountability and report the emergency event to the TAN shift supervisor as described above. Eating, drinking, and smoking are not permitted during emergency evacuations. Radiological Control personnel will assist and direct all workers exiting from radiological contamination areas during a local area evacuation alarm.

10.6 Evacuation Assembly Areas and Central Facilities Area Medical Facility

TAN maintains primary and secondary evacuation routes and assembly areas. These routes may be used in response to a total facility evacuation as directed by the TAN emergency coordinator. Copies of the following figures will be available in the project operations area. Figure 10-1 shows the TAN evacuation and assembly areas and Figure 10-2 contains a map showing the location of CFA-1612 medical facility within the Central Facilities Area (CFA).

In the event that the project operational area is evacuated, personnel shall assemble in the designated assembly area, or as directed by the FTL (local area evacuation) or TAN emergency coordinator. If a total area evacuation of the TAN is ordered, then project personnel shall relocate to the TAN primary evacuation assembly area (see Figure 10-1) or as directed by the emergency coordinator.

10.7 Medical Emergencies and Decontamination

Medical emergencies and responses to injuries or suspected exposures will be handled as stated in Section 8.2. Decontamination of personnel and equipment is described in Section 11.2.

10.8 Reentry, Recovery, and Site Control

All reentry and recovery activities will follow general Site security and control requirements identified in Section 7 unless conducted as part of an emergency response action. All entries into project areas performed in support of emergency actions will be controlled by the on-scene commander.

10.8.1 Reentry

During an emergency response it is sometimes necessary to reenter the scene of the event. Reasons for performing a reentry may include:

- Performing personnel search and rescues
- Responding to medical first-aid needs
- Performing safe shutdown actions of operational equipment or processes
- Performing mitigating actions
- Evaluating and preparing damage reports
- Performing radiation or hazardous material surveys.

Reentries will be carefully planned to ensure that personnel are protected from harm and to prevent initiating another emergency event. Reentry planning is undertaken on a graded approach and will be based on the nature of the initiating event, hazards to personnel and structures, and purpose for the reentry.

10.8.2 Recovery

After the initial corrective actions have been taken and effective control established, response efforts will shift toward recovery. Recovery is the process of (1) assessing post-event and post-emergency conditions, (2) developing a plan for returning to pre-event and pre-emergency operating conditions, when possible, and (3) following the plan to completion. The TAN emergency coordinator, in consultation with the TAN nuclear facility manager (NFM), operations manager and TAN Operations Director (OD) are responsible for determining when an emergency situation is sufficiently stable to terminate the emergency and enter the recovery phase. The NFM, with concurrence from the operations manager and in consultation with the TAN OD, will appoint the recovery manager.

Where a restart of project remedial actions is required following a shutdown, all operational requirements of MCP-1126, "Performing Management Self-Assessments for Readiness," will be followed.[a]

10.9 Critique of Response and Follow-up

A review and critique will be conducted following all emergency events, drills, and exercises at the INL. In some cases, an investigation may be required before commencing recovery actions. For this reason care should be exercised to preserve evidence when appropriate. The TAN NFM or operations manager will lead all critiques of project events requiring a critique in accordance with PLN-114.

10.10 Telephone and Radio Contact Reference List

Table 10-3 lists the points of contact for the V-Tanks project. A copy of this list or similar list with key operational contacts will be posted at the TAN shift desk at all times. Because personnel listed may change frequently, working copies will be generated as required to note new positions and changes of personnel assigned. This HASP should not be revised with a document action request (DAR) to note these changes.

a. **NOTE:** The V-Tanks remediation is classified as a less than Hazard Category 3 (HAD-305); therefore, MCP-2783 for restart of nuclear facilities does not apply.

TAN Area
Primary Assembly Area

Emergency Response

Person discovering an event should:

- **Immediately telephone 777 from INEEL phone, the Warning Communications Center 526-1515 or Fire Alarm Center 526-2212**
- **Then call Plant Shift Supervisor at 526-9504**

Event Reporting Information

Type of event
Location
Magnitude
Cause needed
Affected personnel

Alarms and Responses:

Steady Siren	Take Cover	**Seek shelter in the nearest building.** **All doors and windows are to be shut.** **Do not eat, drink, chew, or smoke.** **Turn ventilation off as directed by management.** **Prepare for evacuation.**
Steady Siren with Voice Voice Message	Security Take Cover	**Seek shelter in the nearest building.** **Do not leave work area.** **Stay away from windows and doors.** **Listen for instructions over the emergency warning system.**
Alternating Siren	Evacuate	**Proceed immediately to the designated assembly area as indicated by the evacuation route (see inset).** **Report to your personnel warden.**
Fire Voice Message	Fire	**Evacuate immediate area and go to the staging area (see inset).**
Emergency Warning System Voice Message	Other	**Follow directions of message.**

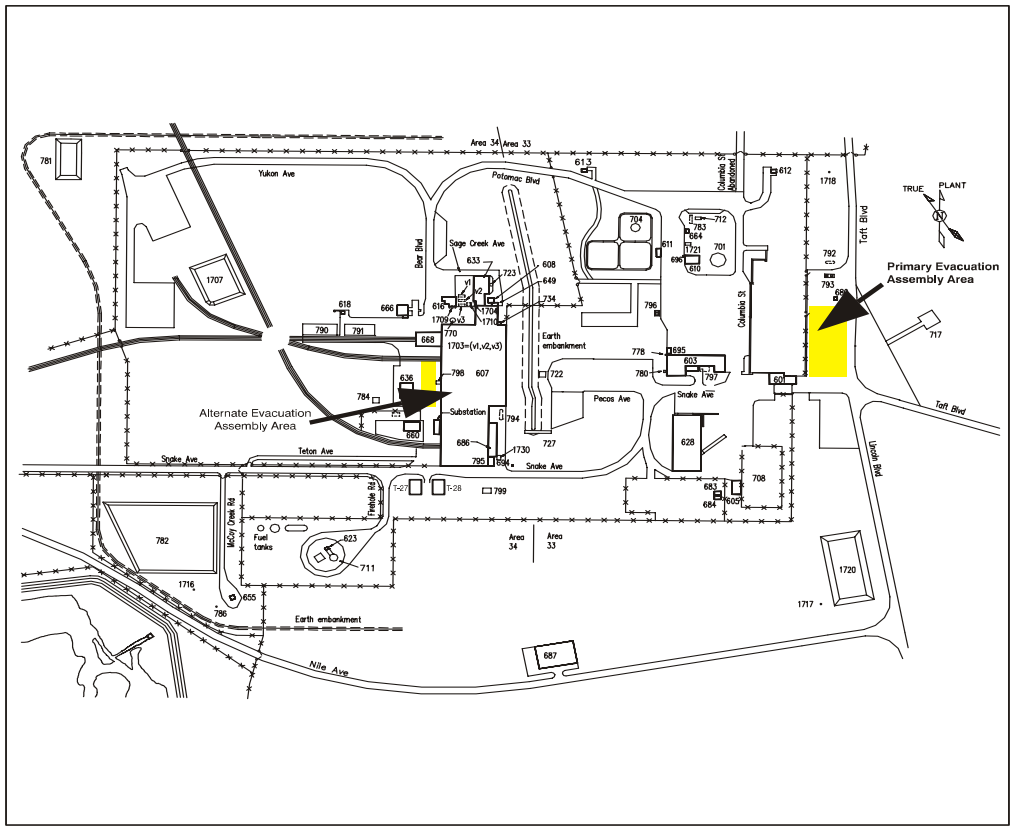


Figure 10-1. Evacuation and assembly areas at the Test Area North.

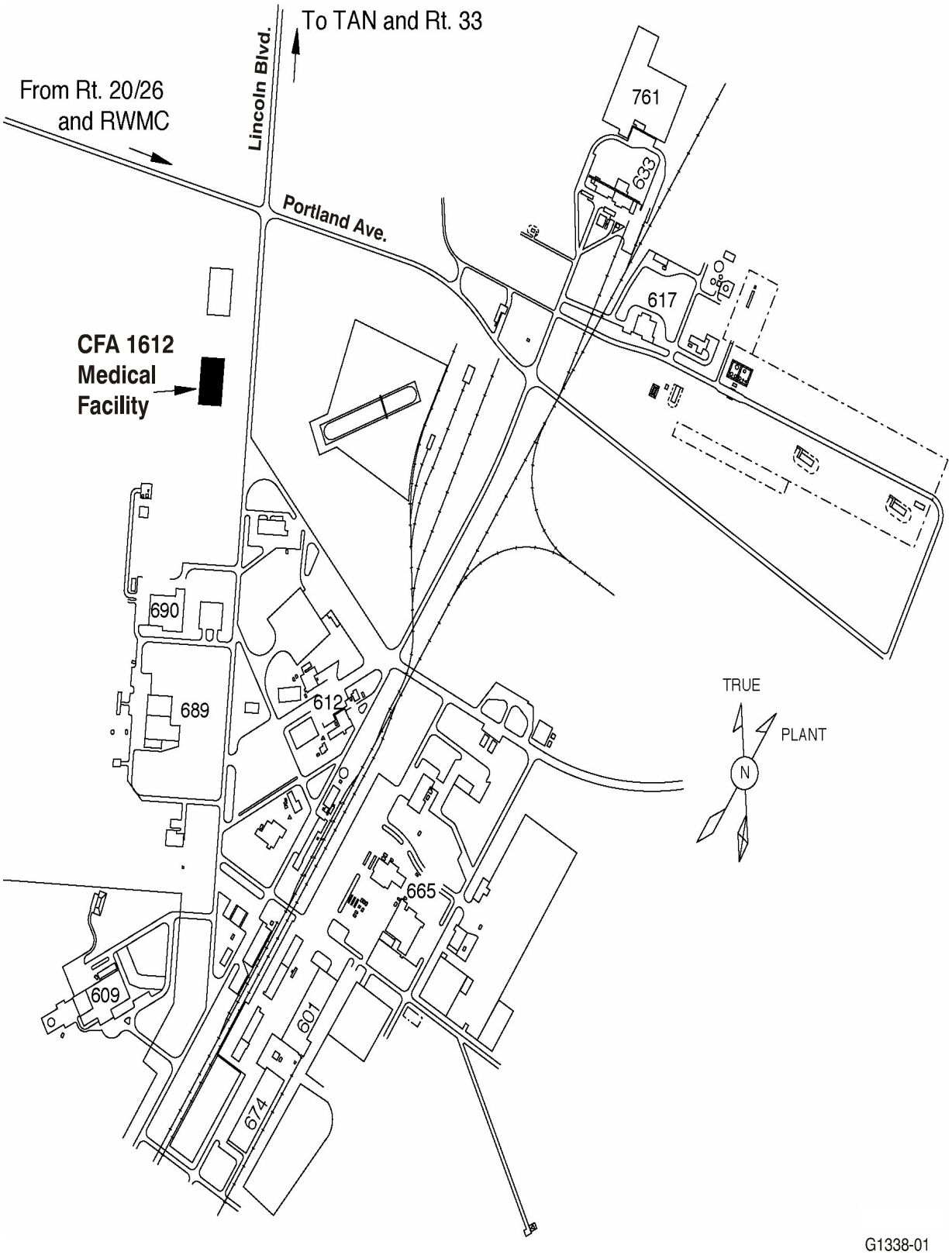


Figure 10-2. Map showing the route to the Central Facility Area medical facility (CFA-1612).

Table 10-3. Project emergency contact list.

INL Emergency Services		INL Phone	Cellular or Offsite
Warning Communications Center (WCC) **Medical emergency** **Fire** **Security**		**Dial 777**	**Dial 526-1515** Construction-Net or WCC/Emergency channel on hand-held Radio "KID-240"
Spill Notification		**777 Or 9-351-6663 Or Pager 6663**	**351-6663 Or Pager 6663 Or 526-1515**
Name	Position	Telephone Number	
Hoss Brown	TAN D&D Director	(208) 526-4214 (208) 569-0624	
Al Millhouse	TAN Nuclear Facility Operations Manager	(208) 526-6932 (208) 360-0333	
Randy Sayer	SH&QA Manager	(208) 526-5706	
Allen Nellesen	Radiological Control Manager	(208) 526-6638	
Allen Jantz	D&D Subproject Manager V-Tanks Project	(208) 526-8517	
Jim Jessmore	D&D Subproject Manager V-Tanks Project	(208) 526-7558 (208) 360-0324	
Lynn Schwendiman	D&D Subproject Manager WAG 1 New Sites Project	(208) 526-8732	
Dave Nickelson	WAG 1 Project Engineer	(208) 526-3860	
John Harris	WGS Facility Representative	(208) 526-3461	
Dave Eaton	Project Environmental Leads	(208) 526-7002 (208) 520-3714	
Rick Woods	Health and Safety Officer (During Site preparation and soil remediation activities)	(208) 526-4164	
Nathan Wegerner	Health and Safety Officer	(208) 526-5213	
Benjamin Shagula	Industrial Safety	(208) 526-0585	

Table 10-3. (continued).

Name	Position	Telephone Number
Sherman Butler	Fire Protection Engineer	(208) 526-6644 360-0395
Chuck Mills	Radiological Control Foreman	(208) 526-4165 (208) 360-0029
Rick Sorrensen	Radiological Engineer	(208) 526-9747
Orin Marcum	QA Engineer	(208) 526-3757
Tracy Elder	Sample Analysis Management	(208) 526-2076
Paul Sloan	Field Engineer (V-Tanks Transfer and Treatment)	(208) 526-3081
Rick Woods	Field Team Leader/STR (During Site preparation and soil remediation activities)	(208) 526-4164
Bryan Crofts	Field Team Leader/Construction Coordinator (During waste transfer and treatment operations)	(208) 526-6366 (208) 360-0325

D&D = decontamination and dismantlement
SH&QA = safety, health, and quality assurance
TAN = Test Area North
VCO = Voluntary Consent Order
WAG = waste area group
WGS = Waste Generator Services

11. DECONTAMINATION PROCEDURES

Project activities will involve decontamination of the exterior surfaces of the V-Tanks and other contaminated items requiring decontamination at new site locations, and potentially some degree of personnel decontamination. Every effort will be made to prevent contamination of project personnel and equipment through the use of engineering controls, isolation of source materials, contaminant monitoring, personnel contamination control training, and by following material handling requirements and procedures for contaminated or potentially contaminated materials. Where contact with potentially contaminated surfaces or entry into known contaminated areas is anticipated, additional radiological monitoring as described in Section 3 in combination with use of PPE will be necessary to control the hazard. This section provides guidance on how decontamination of equipment and personnel will be performed.

Project engineering design features (confinements) in conjunction with contamination prevention and control practices and proper protective clothing donning and doffing procedures, will serve as the primary means to eliminate the need for personnel decontamination. Where decontamination is required, decontamination procedures will be used. MCP-148, "Personnel Decontamination," contains information on personnel radionuclide decontamination. Radionuclide decontamination operations required for equipment or areas will be performed in accordance with Chapter 4 of *Manual 15A – Radiation Control Procedure* (PRD-183) and at the direction of RadCon personnel.

11.1 Contamination Control and Prevention

Contamination control and prevention procedures will be implemented to minimize project personnel contact with contaminated surfaces that will encountered during remedial actions and waste handling and storage. The use of engineering controls, protective barriers, protective clothing, modified work control practices, or addition of hold points and surveys will all be used to minimize direct contact with contaminated surfaces. The following contamination control and prevention measures will be employed:

- Identify potential sources of contamination and design containment, isolation, and engineering controls to eliminate or mitigate any potential for contact or release of contaminants (where feasible)
- Preplan all activities where contact with contamination is anticipated and conduct dry runs to validate operating procedures or maintenance activities as deemed appropriate
- Sleeve or place a disposable barrier between equipment and tools and the contaminated surface or environment (where feasible)
- Limit the number of personnel, equipment, and materials that enter the contaminated area
- Wear disposable outer garments and use disposable equipment (where possible)
- Use hold points defined in procedures and work orders to monitor for contamination where anticipated
- Implement immediate decontamination procedures to prevent the spread of contamination where contamination is found on the outer surfaces of equipment or grossly contaminated clothing during operational activities (including decontamination tasks)

- Use only the established radiological entry and exit control points when accessing contaminated areas to minimize the potential for cross-contamination and expedite contamination control surveys.

11.2 Equipment and Personnel Decontamination

Project operational decontamination procedures will be used for routine decontamination of the contaminated equipment to prevent the spread of contamination and to meet remedial action or waste acceptance criteria requirements. In addition, decontamination is necessary to control contamination and protect confinement areas to maintain a clean working area within the consolidation tank trailer area. Both radiological and nonradiological contamination will be evaluated when decontaminating surfaces.

Radionuclide decontamination operations for equipment or areas will be performed in accordance with Chapter 4 of the RCM (PRD-183) and the V-Tanks Project Decontamination Plan (ICP 2005a) at the direction of RadCon personnel. Nonradionuclide decontamination will be conducted in accordance with established project procedures or on a case-by-case basis under the direction of Industrial Hygiene personnel to determine the most appropriate PPE. In all cases, the collection, storage, and disposal of decontamination waste will be addressed before the generation of such waste and stored as described in Section 11.4.1. Protective clothing and respiratory protection selected for decontamination tasks will be based on the contaminant being decontaminated and as described in Section 5.

11.2.1 Equipment Decontamination

Decontamination of sampling equipment will be conducted in accordance with GDE-162, "Decontaminating Sample Equipment." If contact with potentially contaminated surfaces cannot be avoided, then additional engineering controls in combination with PPE upgrades may be necessary to control the contact hazard. Equipment will be decontaminated based on the source of contamination.

When conducted, equipment decontamination will be performed in accordance with established project decontamination procedures described below. Low-cost consumable items will be discarded if initial decontamination efforts fail or extensive decontamination is required that is not in accordance with ALARA principles.

If radioactive material decontamination operations are required for equipment or areas, they will be performed in accordance with Chapter 4 of *INL Radiological Control Manual*. Nonradioactive material decontamination will be evaluated on a case-by-case basis by the HSO and project industrial hygienist to determine the most appropriate PPE (Level C protective clothing will initially be selected if airborne contaminants may be generated until site monitoring can demonstrate downgrading is warranted).

Small equipment with only the possibility of external contamination will be decontaminated using a wipe-down method. Wipe-down consists of wiping the accessible surfaces of the item with a terrycloth wipe, or similar material, to remove any water or soils adhering to the surface. If necessary, the wipe may be soaked with a non-phosphate detergent and then used to wipe the equipment down. Subsequent to this, a wipe soaked with clean water will be used to complete the cleaning. Wipes, after use, are managed as waste in accordance with the project WMP.

A graded decontamination approach will be utilized for decontamination of heavy equipment. This approach employs dry decontamination methods first (e.g., brushing, sweeping, wiping where radiological concerns do not prohibit these practices). If it is deemed necessary and appropriate by the project industrial hygienist that further decontamination is necessary, then wet wiping with an amended water solution (e.g., amended with a nonphosphate detergent such as Alconox) or a potential steam

cleaning of this equipment may be conducted. A drainage system that allows for a single collection point will be established if steam cleaning is performed. Decontamination wastewater will be collected using a submergible pump or equivalent and characterized in accordance with companywide *Manual 17—Waste Management*, and relevant MCPs.

11.2.2 Personnel Decontamination

Engineering controls, in conjunction with project contamination prevention and control practices and proper protective clothing donning and doffing procedures, will serve as the primary means to eliminate the need for personnel decontamination. The PPE selection, as identified in the RWP and JSA, will provide for the layered barriers required to prevent permeation and minimize external surface contamination.

Instructions for donning and doffing radiological protective clothing will be posted at the entry and exit control points to all contamination areas in accordance with PRD-183. Before donning PPE, all items will be inspected following the list in Table 5-3. One of the greatest potentials for personnel contamination exists from improper doffing of contaminated PPE when exiting a contamination area. All project personnel who enter radiological contamination areas will doff PPE following the posted instructions. If questions or problems arise while doffing (such as tearing protective clothing), guidance and assistance on how to proceed should be requested from the assigned RCT.

If personnel decontamination is required, it will be conducted in accordance with Chapter 5, "Radiological Health Support Operations," Part 4, "Handling Radiologically Contaminated Personnel" of the INL RCM.

11.2.3 Decontamination in Medical Emergencies

If a person is injured or becomes ill, that person will be immediately evaluated by first-aid trained personnel (on a voluntary basis) at the project task site. If the injury or illness is serious, then the FTL will contact the TAN shift supervisor or WCC (if the shift supervisor cannot be reached) to summon emergency services (i.e., fire department and TAN or CFA medical services) to the project site.

Medical care for serious injury or illness will not be delayed for decontamination. In such cases, gross decontamination may be conducted by removing the injured person's outer protective clothing (if possible) and other contaminated areas may be contained with a bag or glove. If contaminated PPE cannot be removed without causing further injury (except for the respirator, which must be removed), the individual will be wrapped in plastic, blankets, or other available material to help prevent contaminating the inside of the ambulance, medical equipment, and medical personnel.

The industrial hygienist or the RCT (depending on the type of contamination) will accompany the employee to the medical facility to provide information and decontamination assistance to medical personnel. Contaminated PPE then will be removed at the medical facility and carefully handled to prevent the spread of contamination. The *INL Radiation Protection Manual*, Chapter 5, and MCP-148, "Personnel Decontamination," contains information on proper handling of radioactive material contaminated wounds.

11.3 Doffing Personal Protective Equipment and Decontamination

Where contamination may be detected on outer layers of PPE, doffing of PPE will serve as the primary means to isolate this source of contamination. However, some preliminary surface decontamination of protective clothing may be required if it is grossly contaminated and the potential for the generation of airborne radioactivity or organic vapor emissions exists. This will involve assistance from other personnel inside the contamination area and at the doffing location as described below. The ultimate goal of all decontamination methods is to effectively and efficiently isolate the source of contamination through removal of protective clothing and confinement of the contamination in a sealed bag or waste container.

If contamination is detected on outer PPE layers, careful removal of these outer PPE layers will generally isolate over 99% of surface contamination and this will serve as the primary decontamination method if protective clothing is contaminated. Removal of contaminated protective clothing using standard radiological doffing techniques (i.e., rolling outer surfaces inward and from top to bottom while being removed) provides the most effective method for containing and isolating the contaminants and greatly reduces the potential for exposure to other personnel who would be put at risk of cross-contamination from other decontamination methods (e.g., washing and brushing).

Where protective clothing also is worn as an anti-contamination layer, then tape, gloves, booties, and any required dosimetry will be removed following the posted doffing sequence. All PPE will be placed in the appropriately labeled waste containers. Doffing and any required decontamination will take place at the designated contamination area boundary or step-off pad, If exiting a radiological contamination area, personnel will conduct the proper personal survey with hand-held detectors followed by an automated whole-body survey in a PCM (or equivalent), as stated in the RWP.

A general approach for doffing modified Level D or C PPE is described below. However, no single doffing strategy works for all circumstances. Modifications to this approach are appropriate if operational conditions change or at the discretion of the RadCon Manager in consultation with the IH. Both radiological and nonradiological hazards will be evaluated, as applicable.

11.3.1 Modified Level D Personal Protective Equipment Doffing and Decontamination

Modified Level D protective clothing (e.g., Tyvek coveralls and booties) will be doffed following standard radiological removal techniques (as posted) and will constitute the initial contamination isolation step. If the protective clothing is also being worn as an anti-contamination layer, then tape, gloves, booties, and any required dosimetry will be removed following the posted doffing sequence. All PPE will be placed in the appropriately labeled waste container(s) for disposal. Doffing and isolation of any contaminated protective clothing or skin area will take place at the boundary between the contaminated area and the step-off pad. Normally, doffing will be followed by conducting a personal contamination survey, as stated in the RWP. If decontamination is required, it will be performed in a low background area.

NOTE: *Under some radiological conditions, two sets of anti-contamination clothing may be worn. When required, the posted instructions will address the proper doffing sequence for both sets.*

11.3.2 Level C Personal Protective Equipment Doffing and Decontamination

Where respiratory protection is worn in conjunction with protective clothing (Level C PPE), the modified Level D sequence will be followed with one additional step. Following protective-clothing doffing, respirators will be removed and placed in a separate container. A survey of the face and sealing

surfaces of the respirator then will be performed by the RCT or as part of the posted survey instructions by the respirator wearer. Doffing and any required decontamination will take place as described above. If exiting a radiological contamination area, personnel will conduct the proper personal survey, as stated in the RWP.

11.4 Personnel Radiological Contamination Monitoring

Radiological surveys (with hand-held detectors and an automated whole-body PCM) will be required before personnel exit project operational areas or as stated on the RWP. The purpose of this hand□held instrument survey is to detect surface contamination. If survey instruments show an elevated reading or the PCM alarms indicate elevated contamination levels are present, personnel should remain in the area and contact (or have someone in a nonradiologically controlled area) contact RadCon. When exiting a contamination area or contamination radiological buffer area, an automated whole-body survey using a PCM station (or equivalent) must be conducted before using designated eating or smoking areas.

11.4.1 Storage and Disposal of Investigative Derived Waste Materials

Waste generated from decontamination and other project operational activities will be properly characterized, stored, and disposed of in accordance with the following documents:

- *Manual 17 – Waste Management* (Waste Management 2004)
- *Waste Management Plan for the TSF-09/18 V-Tanks and Contents Removal and Site Remediation Test Area North, Waste Area Group 1, Operable Unit 1-10,* (ICP 2005b)
- Established project procedures
- Waste-disposal and disposition forms.

Waste also will include PPE and miscellaneous sampling materials (e.g., sampling waste, decontamination waste, paper towels, plastic bags, gloves, etc.). If contaminated, the waste will be bagged, secured with duct tape, and labeled in accordance with instructions from the RCT and WGS representative. Free release surveys of suspected radioactively contaminated waste will be conducted in compliance with MCP-425, "Radiological Release Surveys and the Disposition of Contaminated Materials."

Cold (nonradioactive) waste is sent to the Central Facilities Area (CFA) landfill or another INL-designated solid-waste landfill. Low-level radioactive waste is stored in the WAG 1 CERCLA storage area inside a radioactive material area in accordance with MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INL," and MCP-121, "Areas Containing Radioactive Materials." The waste will be evaluated for additional characterization and managed as low-level radioactive waste. Final disposition will be coordinated with Waste Generator Services.

11.4.2 Site Sanitation and Waste Minimization

Project personnel will use washroom and restroom facilities located within TAN-607 area. Potable water and soap are available within TAN-607 for personnel to wash their hands and faces.

Industrial waste materials will not be allowed to accumulate at the project operational areas. Appropriate containers for industrial waste will be maintained within the project operational areas. Personnel should make every attempt to minimize waste through judicious use of consumable materials. All project personnel are expected to make good housekeeping a priority.

12. RECORDKEEPING REQUIREMENTS

12.1 Industrial Hygiene and Radiological Monitoring Records

The IH assigned to the project will record airborne monitoring and sampling data (both area and personal) collected for project operational exposure assessments in the INL Hazards Assessment and Sampling System Database. All monitoring and sampling equipment will be maintained and calibrated in accordance with INL procedures and the manufacturer specifications. Industrial hygiene airborne monitoring and sampling exposure assessment data are treated as limited access information and maintained by the IH in accordance with INL Safety and Health Manual procedures.

The assigned RCTs will maintain a logbook of radiological monitoring, daily project operational activities, and instrument calibrations where instruments were used to document detection levels or conduct field screening of samples. Radiological monitoring records will be maintained in accordance with Manual 15B, PRD-183, and MCP-9, "Maintaining the Radiological Control Logbook."

All other health, safety, and radiological records, including inspections, will be maintained in accordance with appropriate and applicable requirements identified in Manuals 14A, 15A, 15B, and 15C, and applicable TAN and project supplements.

12.2 Field Team Leader and Sampling Logbooks

Logbooks will be maintained in accordance with MCP-1194, "Logbook Practices for ER and D&D&D Projects." The FTL will keep a record of daily site events in the FTL logbook and will maintain an accurate site attendance logbook of all personnel (e.g., workers and nonworkers) who are onsite each day. Logbooks must be obtained from the field data coordinator for the INL Sample Management Office. The completed logbooks must be returned to the INL Sample Management Office within six weeks of project completion. The logbooks are then submitted to ICP Document Control.

12.3 Idaho Completion Project Document Control

The Idaho Completion Project (ICP) Document Control organizes and maintains data and reports generated by ICP Program field activities. The ICP Document Control maintains a supply of all controlled documents and provides a documented system for the control and release of controlled documents, reports, and records. Copies of the project plans for ICP, this HASP, the "BIC Project Execution Plan" (PLN-694), the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10 and Inactive Sites* (DOE-ID 2004b), and other project-specific documents are maintained in the project file by ICP Document Control.

Completed sample logbooks are submitted to the Sample Management Office within six weeks of project completion. All other project records and logbooks, except Industrial Hygiene logbooks, must be forwarded to the Administrative Record and Document Control within 30 days after completion of field activities.

12.4 Site Attendance Record

If required to be maintained separately, the site attendance record will be used to keep a record of all personnel (i.e., field team members and nonfield team members) onsite each day, and to assist the area warden with conducting personnel accountability should an evacuation take place (see Section 10 for emergency evacuation conditions). Personnel will only be required to sign in and out of the attendance record once each day. The FTL is responsible for maintaining the site attendance record and for ensuring that all personnel on the project site sign in (if required).

12.5 Administrative Record and Document Control Office

Administrative Record and Document Control (ARDC) will organize and maintain data and reports generated by ICP Program field activities. The ARDC maintains a supply of all controlled documents and provides a documented system for the control and release of controlled documents, reports, and records. Copies of the management plans for the ICP Program, this HASP, the "BIC Project Execution Plan" (PLN-694), the quality assurance project plan, and other documents pertaining to this work are maintained in the project file by the ARDC.

12.6 Training Records

Training records for project personnel will be kept in accordance MCP-85, "Training Records Administration," by the project training organization. Documentation of a qualification or certification is placed in an employee's training file and maintained by the appropriate training organization. Employee experience and employment history records are maintained by the Human Resources organization in individual personnel files.

13. REFERENCES

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29 CFR 1910, 2004, "Occupational Safety and Health Standards," *Code of Federal Regulation,* Office of the Federal Register, August 6, 2004.

29 CFR 1926, 2004, "Safety and Health Regulations for Construction," *Code of Federal Regulations*, Office of the Federal Register, June 10, 2004.

42 USC 6901 et seq., 1976, "Resource Conservation and Recovery Act (Solid Waste Disposal Act)," *United States Code*, October 21, 1976.

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54 FR 223, 1989, "National Priorities List for Uncontrolled Hazardous Waste Sites," *Federal Register*, Environmental Protection Agency, pp 48184 et seq., November 21, 1989.

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14. DRAWINGS

INEEL Drawing No. 423666, "TAN TSF Area Sanitary Drain Site Plan," Rev. 0, Status: Inactive, November 1, 1994.

FOR PIPING SYMBOLS AND ABBREVIATIONS SEE DWG 422623.

TO IET

EARTH EMBANKMENT

781

YUKON AVE.

POTOMAC BLVD.

BEAR BLVD.

COLUMBIA ST.

STORAGE AREA 6

STORAGE AREA 7

648

647

735

705

TO LOFT

FOR CONT SEE DWG 424805

FOR CONT SEE DWG 424803

615

633

614

668

649

666

618

FOR CONT. SEE DWG. 424800 SH. 2

FOR CONT. SEE DWG 424800 SH. 2

662

607

FOR CONT SEE DWG 424806

636

784

660

FOR CONT. SEE DWG 424800 SH. 1

SMC

PARKING AREA 4

CUT, PLUG & ABANDON EXISTING 6" SEWER

TETON AVE.

SNAKE AVE.

TO LOFT

638

ABANDONED

782

FIRE HOLE RD.

FUEL TANKS

670

623

711

SEWAGE TREATMENT FACILITIES

655

8"

ABANDONED & CAPPED

DISPOSAL WELL

EARTH EMBANKMENT

TO POND

NILE AVE.

704

724

702

611

613

612

664

FOR CONT SEE DWG 424802

610

701

SMC

602

PARKING AREA 2

667

604

FOR CONT SEE DWG 424799

653

FOR CONT SEE DWG 424798

603

FOR CONT. SEE DWG 424797

606 SMC

PECOS AVE.

SNAKE AVE.

601

FOR CONT. SEE DWG 424797

PARKING AREA 8

PARKING & STORAGE AREA 4

628 SMC

708 REF ELECTRIC

STORAGE AREA 5

605

ABANDON

FOR CONT SEE DWG 424804

DRAIN SUMP

609

SEEPAGE PIT SEE PROCESS DRAIN DWG. 425307

LEGEND

TYPICAL MANHOLE

RELEASED FOR RECORD ONLY
DO NOT FABRICATE
CHECKER
DATE 2-9-89

E.J. HUNTER	2-88	NONE	ED	NONE	

TAN/TSF AREA SANITARY DRAIN SITE PLAN

423666

E 03 03 00 50 220